Standalone Bill Counter

Maintenance Manual

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Overview

Dolphin Series Bill Counter is a kind of intelligent high-speed discriminator for sorting and counting bank notes. It's of a standalone design. It separates bank notes with the effect of friction capability and is controlled by a single chip microcomputer with multiple functions. In order to make the bill counter an accurate, reliable, practical and convenient product, thoughtful design and system optimization have been achieved.

This manual has provided necessary methods and suggestions to the engineers and technicians who perform repair and maintenance to DOLPHIN Bill Counter.

Required Tools and Instruments for Maintenance

20M oscilloscope	solder sucker	tweezers
digital multimeter	**monkey wrench**	diagonal pliers
wire stripper	flat screwdriver set and **electric iron**	long nosed pliers
Phillips screwdriver set		

Figure 1a Appearance of the Machine (front)

1. lifting handle component	6. sensor of left counter	10. bill receiving sensor
2. bill **linkage baffle component**	7. component of receiving wheel shield	11. right counting sensor
3. left shield	8. bill receiving wheel	12. monitor
4. film panel	9. bill receiving baffle	13. right shield
5. bed plate component		

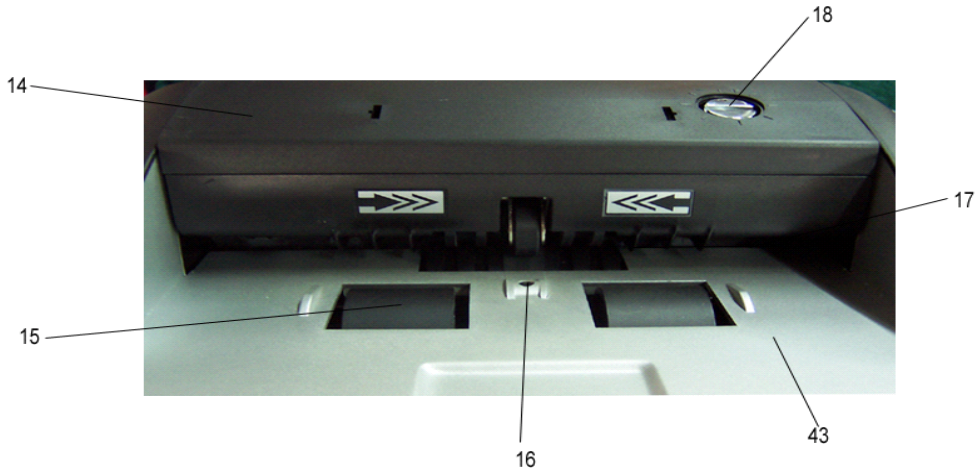


Figure 1b Appearance of the Machine (upper part)

14. upper cover board
15. feeding wheel
16. stacker sensor
17. bill feeding gate
18. adjusting turner
43. bill feeding platform

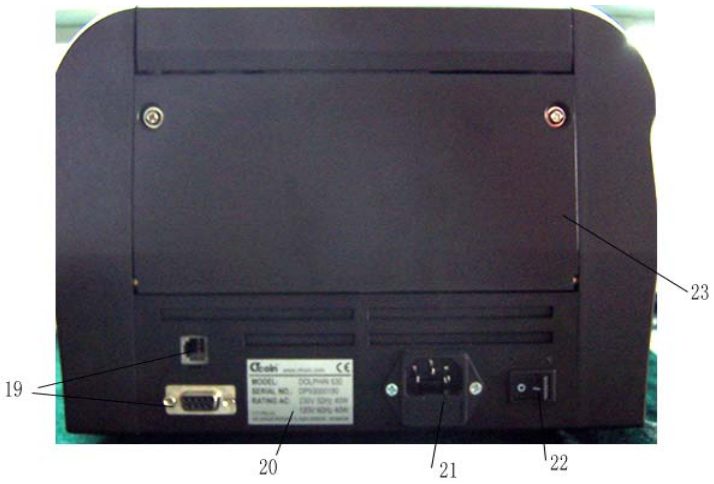


Figure 1c Appearance of the Machine (front)

19. external display, interface for computer communication
20. nameplate
21. power socket
22. power switch
23. rear upper cover board

Introduction to the Whole Unit

Dolphin Series Bill Counter consists of two parts, a mechanical and an electrical. The mechanical part includes the frame, structural parts, shell, bill rubbing mechanism and conveyance mechanism. The core of the mechanical part is the bill rubbing and conveyance mechanism. The electrical part includes various sensors and the acquisition amplifying circuit, single-chip microprocessor, power and power system for their input signals, as well as the control to input and output signals of the single-chip microprocessor, the analysis treatment to the signals and the control of such operation process.

3.1Technical Specification of the Whole Unit

Bill counting capability: feeds 200~300 bills; receives 200 bills

Sizes of bills: 0.05mm~0.2mm x 50mm~90mm x 120mm~175mm (thickness x width x length)

Manner of display: LCD or LED monitor

Power supply: 220V/50HZ/110V/60HZ

Power: about 40W

Environment parameters: temperature 0 ~35 ; relative humidity: 20%~80%

Volume: 290mm x 250mm x 250mm

Weight: 5.5 kilograms

Bill counting speed: 600 turns/minute, 900 t/m, 1200t/m, 1500t/m (the bill counting speeds vary according to different models and bills)

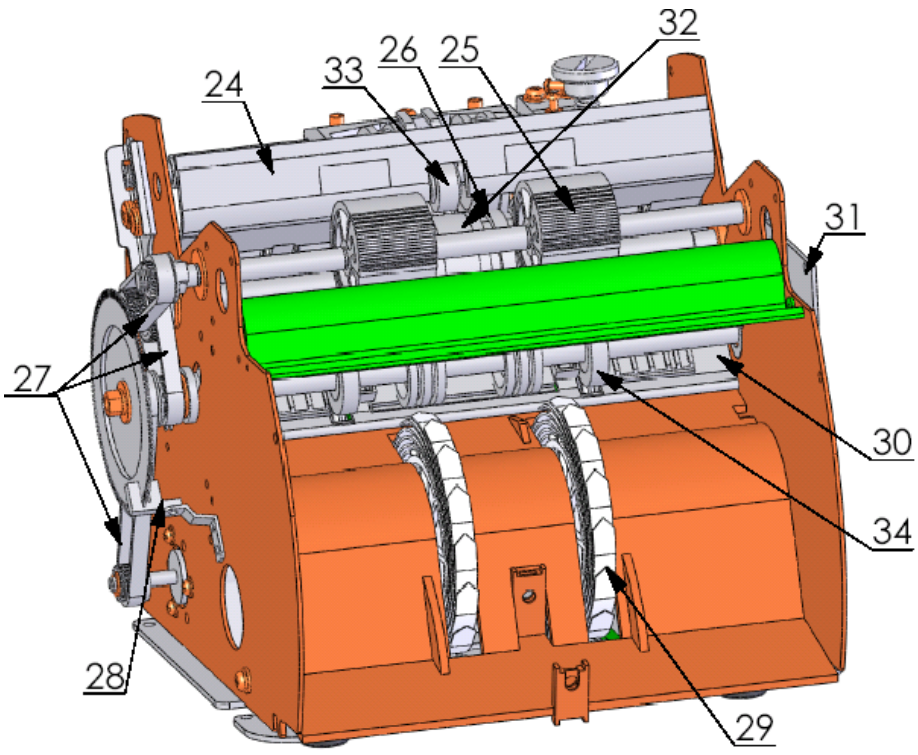


Figure 3 Diagram with upper cover, left and right shield removed

24.separation mechanism	27. synchronous belt	30. conveyance baffle component	33. auxiliary pinch wheel
25.feeding wheel component	28. speed sensor	31. control panel component	34. lower conveyance wheel
26. friction wheel	29.bill receiving wheel component	32. upper conveyance wheel	

Figure 3 Diagram of left and right shields after removal of the upper cover

3.2 Principle and function of the bill rubbing mechanism

The bill rubbing mechanism consists of 15, the feeding wheel and 26, the friction wheel and 24, the separation mechanism, including two parts, the feeding and separation of bank notes. This is the key for a bill counter to be able to count bank notes accurately.

Counting of the bank notes is the process that the machine intermittently generates a friction thrust to the bank notes through rotation of the parts inside the machine. This action is jointly completed by 15, the feeding wheel and 32, the upper conveyance wheel and 26, the friction wheel and 33, the auxiliary pinch wheel.

Separation of the bank notes is the process that the machine separates a deck of bank notes into many single bank notes, which is jointly completed by 26, the friction wheel and 24, the separation mechanism. 24, the mechanism has two functions. One is, in the progress of part rotation inside the machine, the “bill feeding gate, 17” is formed by the interaction of the rubber-free circle surface of 26, the friction wheel and 24, the separation wheel. This action only allows one bank note to go through the gate; the other is to push the bottom bank note into the machine with the joint effect of the intermittent thrust generated on the rubber surface of 15, the feeding wheel and 26, the friction wheel and the resistance generated by 34, the separation wheel which rotates in single direction and stays static intermittently.

3.3 Function of the conveyance mechanism

The conveyance mechanism includes two parts, conveyance and receiving of bank notes.

Conveyance of bank notes is jointly completed by two sets of conveyance wheels, the upper and lower wheels. The function of 32, the upper conveyance wheel, is to swiftly speed up separated bank notes. The function of 34, the lower conveyance wheel, is to enable the bank notes become flat and free of any sliding movement and then go through sensors at a certain speed to guarantee the reliability of data acquisition by the sensors.

Receiving of bank notes is jointly completed by 8, the bill receiving wheel and 9, the bill receiving baffle. 8, the bill receiving wheel makes slow-speed movement along with running of the machine; 9, the bill receiving baffle is installed behind 8, the bill receiving wheel. The high-speed bank notes passed through 34, the lower conveyance wheel, are sent to 8, the bill receiving wheel, and do mid-speed movement from there; when they move to the lower part of 8, the bill receiving wheel, will be collected and piled up at 9, the bill receiving baffle.

3.4 Sensors and detection of their signals

Dolphin Series Bill Counter has five groups of basic sensors and three of which are basic measurement sensors and two of which are basic control sensors. They form a basic detection system. According to difference of machine function

and requirement of bank note detection, many more other kinds of detection sensors can also be added.

The basic measurement sensors include two sets. Each set consists of a 6, the left counting sensor and an 11, the right counting sensor, whose functions are to detect status of a bank note and identify position of a bank note. They are installed next to 34, the lower conveyance wheel. A pair of speed sensors, the 28, which are for measurement of rotation speed of the machine parts, are installed in the left end of the machine.

The basic control sensors include 16, the stacker sensor and 10, the bill receiving sensor. 16, the stacker sensor is a reflective photoelectric device, which is installed onto 43, the bill feeding platform; 10, the bill receiving sensor, is a set of infrared-lit and light-sensitive parts, which is installed in the middle of 9, the bill receiving baffle.

The other measurement sensors for bank notes include H02, the fluorescent sensor, for measuring fluorescence reaction characteristic of paper quality of bank notes; H12, the magnetic detection sensor, for measuring distribution of magnetic ink on bank notes; H07, the safety line detection sensor, for detecting signal of the safety line on a bank note; H04, the sensor for detecting length and size of a bank note; H04B, the infrared ink sensor, for detecting signal of infrared ink on a bank note; these measurement sensors are installed at different positions under baffle of the lower conveyance wheel according to different application requirements and that's the approach to discriminate if a bank note is real or fake.

3.5 Handling and control of signals by the single-chip computer

Data analysis to a bank note by the bill counter and control to running status of the machine are completed by the single-chip computer inside the machine. The whole control process is divided into few steps: handling of operational command and control signal; acquisition and calculation of information from measurement sensors and then conversion from analog quantity to digital quantity; performance of fuzzy analysis and handling to digital quantity; control to the machine according to analysis result and operational requirements.

Running of the bill counter is controlled by the single-chip computer. The single-chip computer executes pre written program inside the machine. Therefore, in progress of actual usage, the user should strictly operate the machine according to the operation manual and this manual.

3.6 Power supply and power system

The power supply system is a device converts 220V or 110V DC current into the DC currents required by all parts of the bill counter.

The DC currents required by all parts of the bill counter include +5V, +6V, ±5V and +24V. +5V is to be provided and used by single chip digital circuits. ±5V is to be provided and used by single chip analog circuits. +24V is to be provided and used by the main motor.

Power of the bill counter is provided by Rare Earth Permanent Magnet (REPM) DC motor (main motor) and DC speed reducing motor (small motor). The small motor provides the power needed by 8, the bill receiving wheel; the main motor provides power for all other parts of the machine.

Operation and Application

4.1 Key functions

Sorting and counting: starts counting from 0 for each time of counting

Accumulating: starts counting from value of the first bill contact with the machine for each time of counting

Presetting number of bills: counts bills according to preset number of bills

Auto start: the machine automatically starts counting as long as bank note exist on 43, the bill feeding platform

Manual start: if 43, the bill feeding platform has any bank note, you can only start the counting by pressing the START/RESET button

Width detection: detects bank notes of different widths

Length detection: detects bank notes of different lengths

Speed adjusting: there are four levels of speeds can be selected

Contents of detection: half of a bank note; overlapping bank notes; multiple bank notes; single bank note

Methods for anti-fake identification: fluorescence identification, magnetic ink identification, safety line identification, identification with infrared characteristic, size identification (configure contents of identification according to different models)

4.2 Operation method

Connect the machine to power supply; switch 22, the power switch from OFF to ON position and then the machine will perform a 2-second self-checking. After the status becomes normal and starting of the machine, the display window will display 0 and it’s ready to count.

1) Adjust the “bill feeding gate, 17”

Proper adjustment of the “bill feeding gate, 17” should be performed according to age and thickness of bills. When often encounter stop of the running during any counting action due to re-counting of bills; or that the number of bills is too large; users should reduce number of bills at the “bill feeding gate, 17”; when fluency level becomes lower, users should increase number of bills at the “bill feeding gate, 17”. Turn in clockwise direction at the “bill feeding gate, 17” to have more bills and anticlockwise to have less.

2) Identification to the gap of the “bill feeding gate, 17"

First turn the axis of 15, the feeding wheel to enable the smooth surface of 15 to face upward; and then respectively insert two new bills into the left and right “bill feeding gate, 17” and then move them back and forth and you should feel obvious resistance; otherwise adjust the gap of the “bill feeding gate, 17”. While the adjustment range exceeds designed range, re-identify position of the adjustment knob of the “bill feeding gate, 17” according to the description in 6.3.

4.3 Functional setting

Diagram of Dolphin Operation Panel

1) Operation of basic functions

Directly enter setting status according to corresponding functions. (According to users' needs, when some machines enter certain functions, it's required to use the preset functional key to enter setting status.)

UV	ON/OFF	Fluorescence identification switch which detects fluorescence reacting characteristic of paper materials of bank notes.
MG	ON/OFF	Magnetic ink identification switch which detects the magnetic ink characteristic of a bank note.
MT	ON/OFF	Safety line identification switch which detects the magnetic or metal characteristic of safety line on a bank note.
DD	ON/OFF	Width detection switch for detecting width dimension of a bank note.
WD	ON/OFF	Length detection switch for detecting length dimension of a bank note.
DEN	Grade 1~16	Grade setting key for detecting grade of repeated bill; choose different repeated bills for identification of sensitivity.
SP	600/900 200/1500	Counting speed setting key for selecting different rotating speed.
ADD	ON/OFF	Sort and count/accumulate switch for; select display manner for showing counting result.
MUL	ON/OFF	Manual/Auto switch for selecting work mode of the machine.

EUR	ON/OFF	Euro (currency) selection key for selecting the identification function for coding of safety line for Euro bank notes.
VAL	ON/OFF	Selection key for sorting and counting certain amount.
CLR		Remove key. Remove currently sorted and counted number of bank notes and number of preset bills.
START		Start/Reset key for return from parameter setting status; remove contents on the display window for counting result; manual bill counter machine is now started.

2) Functional operation for parameter setting

Use the setting key, which is for presetting number of bills to be counted, to enter the password 127, and then press relevant keys to enter the operation of parameter setting. You can set sensitivity grade here. Smaller number, higher sensitivity, high capability for identifying fake bank note, higher possibility of wrong report. When the sensitivity grade is set to be "0", corresponding identifying functions are turned off.

UV	Grade 0~16	Fluorescence identifying sensitivity, Grade 0~16
MG	Grade 0~16	Magnetic ink identifying sensitivity, Grade 0~16
MT	Grade 0~16	Safety line identifying sensitivity, Grade 0~16
DD	Grade 1~16	Width detecting sensitivity, Grade 1~16
WD	Grade 1~16	Length detecting sensitivity, Grade 1~16

Note: sensitivity grades of some models are different from the table above, which won't be described here.

3) Operation for the function of preset number of bills

Different preset numbers of bills to be counted can be preset using Key 0~9 for their presetting function; the machine stops when present number of bills is counted and sorted.

4.4 Machine Debugging Interface

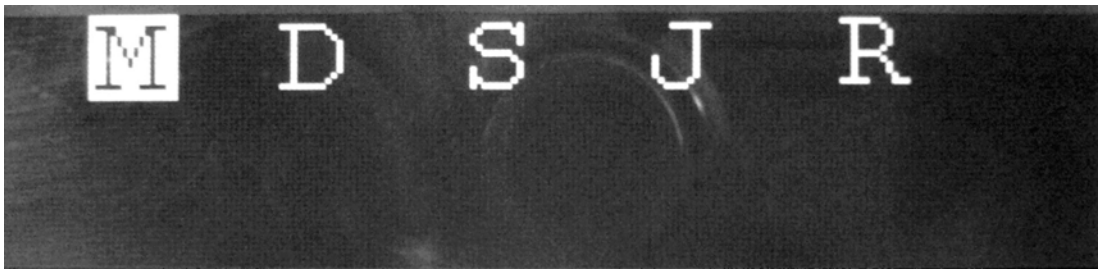
There are two debugging interfaces according to different models

1) The fist kind of debugging interface

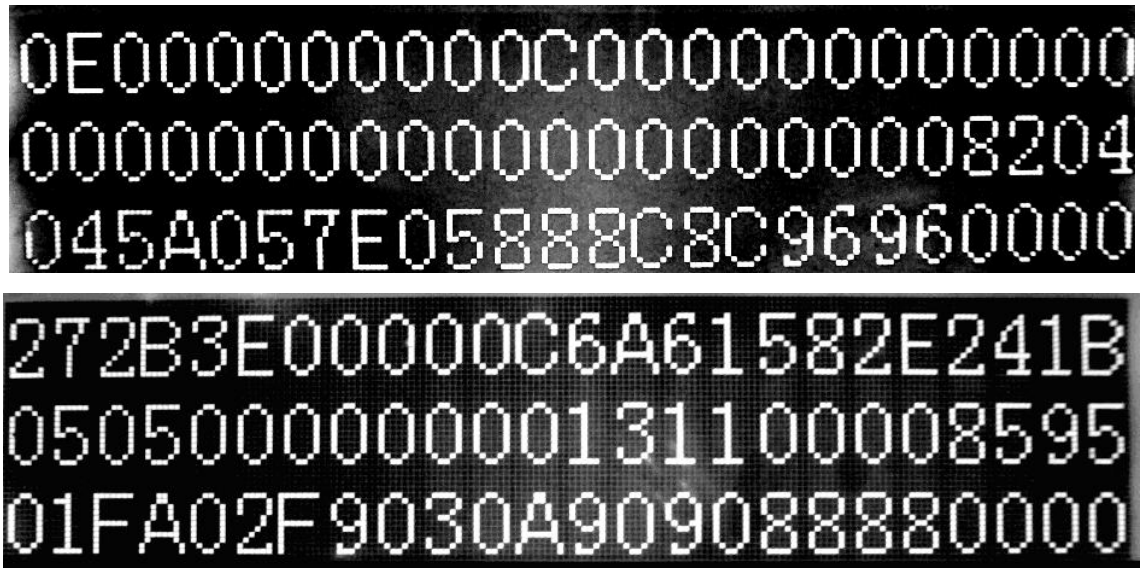
Includes memory data interface, sensor data interface and interface of dimensional detection data.

a) Memory data interface

Keep pressing 1 until the machine enters its debugging interface; M status is the default when entering the debugging interface, namely the memory data interface;



In this status, press the START/RESET key and enter the waiting status for reading and accessing of data; and then press 2 or 3 to switch the two memory data windows and then the memory data will be accessed and read on the screen;



In the memory, positions of data are shown below:

MD1	MD2	MD3	MD4	MD5	MD6	MD7	MD8	MD9	MD10	MD11	MD12
MD13	MD14	MD15	MD16	MD17	MD18	MD19	MD20	MD21	MD22	MD23	MD24
MD25	MD26	MD27	MD28	MD29	MD30	MD31	MD32	MD33	MD34	MD35	MD36

MD37	MD38	MD39	MD40	MD41	MD42	MD43	MD44	MD45	MD46	MD47	MD48
MD49	MD50	MD51	MD52	MD53	MD54	MD55	MD56	MD57	MD58	MD59	MD60
MD61	MD62	MD63	MD64	MD65	MD66	MD67	MD68	MD69	MD70	MD71	MD72

Meaning of data at some key positions:

Position	Data Content	Remark
MD1	Par value codes of Euro	E1=5 Euros E2=10 Euros E3=20 Euros E4=50 Euros E5=100 Euros E6=200 Euros E7=500
MD2	Par value codes of Euro	D1=5 Euros D2=10 Euros D3=20 Euros D4=50 Euros D5=100 Euros D6=200 Euros D7=500
MD3	Par value codes of Euro	C1=5 Euros C2=10 Euros C3=20 Euros C4=50 Euros C5=100 Euros C6=200 Euros C7=500 Euros
MD4	Number of safety line	

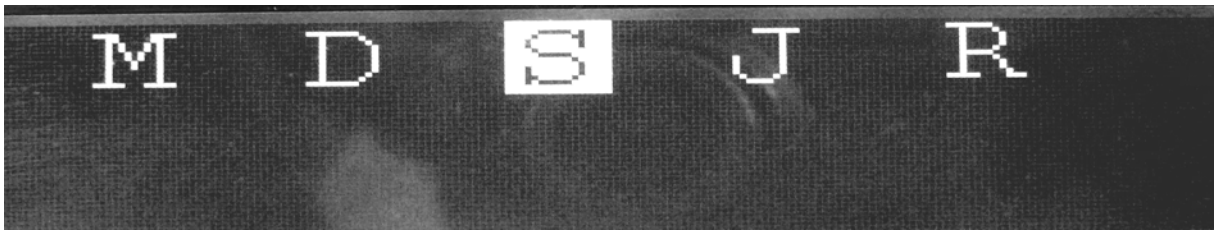
MD5	UV value of the last bank note
MD6	Standard value of UV
MD7	High position of left magnetic data for Model 4011 Maximum value of left counting sensor for Model 6015
MD8	Lowest position of left magnetic data for Model 4011 Mid value of left counting sensor for Model 6015
MD9	High position of right magnetic data for Model 4011 Minimum value of left counting sensor for Model 6015
MD10	Low position of right magnetic data for Model 4011 Maximum value of right counting sensor for Model 6015
MD11	Number of left magnetic pulses for Model 4011 Mid value of right counting sensor for Model 6015
MD12	Number of right magnetic pulses for Model 4011 Minimum value of right counting sensor for Model 6015
MD13	Codes for par value
MD14	Codes for Euro par value
MD15	Width codes for par value
MD16	Length codes for par value
MD17	High position of data for rotation speed of machine parts
MD18	Low position of data for rotation speed of machine
MD19	Data indicates lean of bank note

MD20	Data for lean of bank note
MD23	Data for overlapping bills
MD24	Data for overlapping bills
MD30	Standard value of length
MD31	Data for the length of the last bill
MD33	Standard value of width
MD34	Data for the width of the last bill
MD35	Categories of errors for shutdown of machine
MD36	Sequential number for error data
MD37	Maximum value of left counting sensor for Model 4011 High position of left magnetic data for Model 6015
MD38	Mid value of left counting sensor for Model 4011 Low position of left magnetic data for Model 6015
MD39	Minimum value of left counting sensor for Model 4011 High position of right magnetic data for Model 6015
MD40	Maximum value of right counting sensor for Model 4011 Low position of right magnetic data for Model 6015
MD41	Mid value of right counting sensor for Model 4011 Number of left magnetic pulses for Model 6015
MD42	Minimum value of right counting sensor for Model 4011 Number of right magnetic pulses for Model 6015

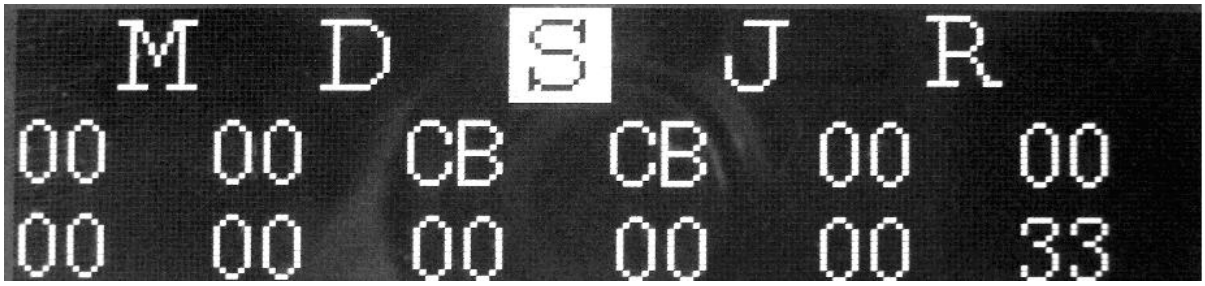
After the debugging, press 1 key to enable the debugging interface to enter R status; press START/RESET key to exit debugging status.

b) Sensor data interface

Keep pressing 1 until it enters the debugging interface; M status is the default when first enter the debugging interface; press 1 again to enter S status, which is the sensor debugging interface;



In this status, press START/RESET key to enter the reading and access interface of sensor data.



Positions of sensor data are shown below:

M	D	S	J	R

SD1	SD2	SD3	SD4	SD5	SD6
SD7	SD8	SD9	SD10	SD11	SD12

Meaning of data at key positions:

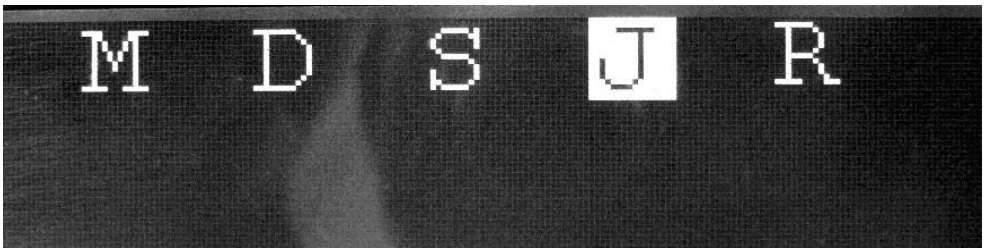
SD1	UV sensor data
SD2	Data of left penetration sensor
SD3	Data of left counting sensor
SD4	Data of right counting sensor
SD5	Data of right penetration sensor
SD8	Data of safety line sensor
SD9	Data of left magnetic ink sensor
SD10	Data of right magnetic ink sensor

After debugging, press 1 and enable the debugging interface to enter R status and then press START/RESET to exit the debugging status.

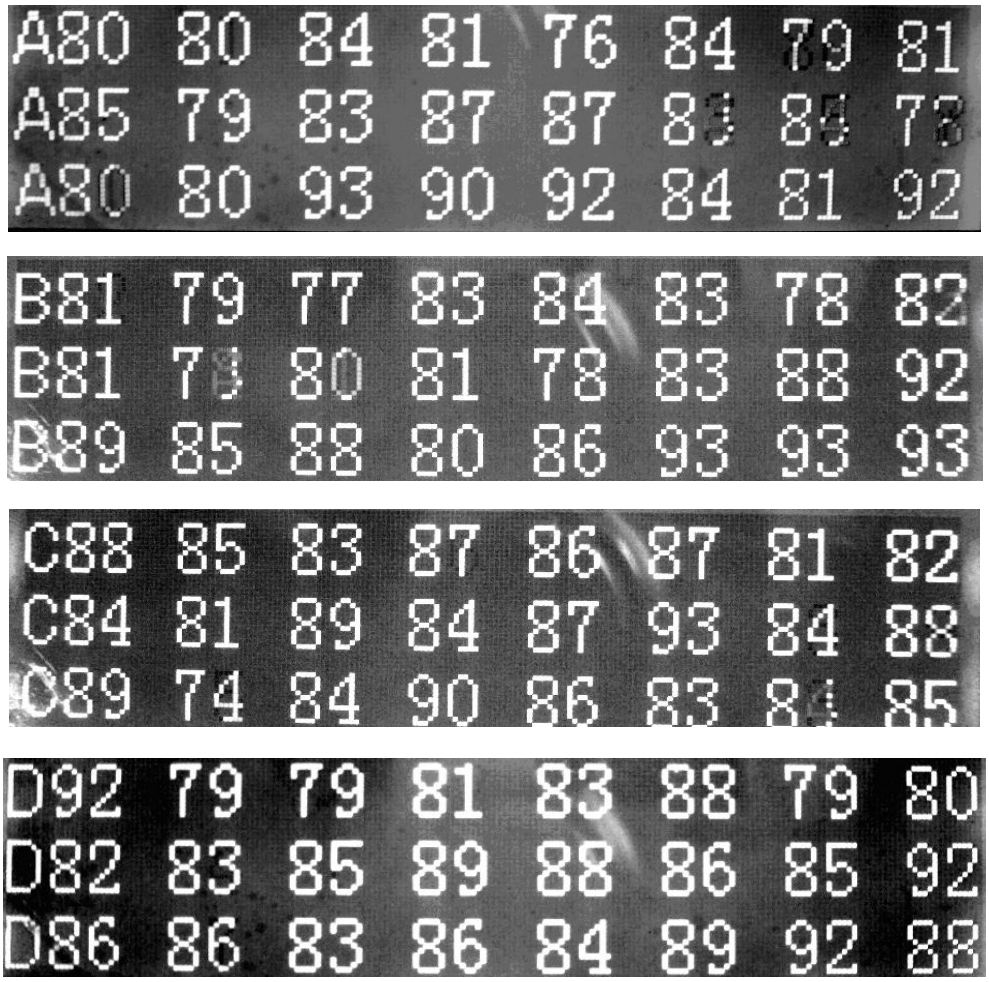
c) Dimension detection data interface

Keep pressing 1 until the machine enters the debugging interface; M status is the default status when it first enters the

debugging interface; press 1 again and enter J status, namely the debugging interface for dimension sensor;



In this status, press START/RESET key and enter the reading and accessing interface of dimension detection data; press 2, 3, 4 and 5 keys to switch among the five pages of A, B, C and D.



Positions and significance of the four pages are shown below:

Page A:

A	AD1	AD2	AD3	AD4	AD5	AD6	AD7	AD8
A	AD9	AD10	AD11	AD12	AD13	AD14	AD15	AD16
A	AD17	AD18	AD19	AD20	AD21	AD22	AD23	AD24

Page B:

B	BD1	BD2	BD3	BD4	BD5	BD6	BD7	BD8
B	BD9	BD10	BD11	BD12	BD13	BD14	BD15	BD16
B	BD17	BD18	BD19	BD20	BD21	BD22	BD23	BD24

Page C:

C	CD1	CD2	CD3	CD4	CD5	CD6	CD7	CD8
C	CD9	CD10	CD11	CD12	CD13	CD14	CD15	CD16
C	CD17	CD18	CD19	CD20	CD21	CD22	CD23	CD24

Page D:

D	DD1	DD2	DD3	DD4	DD5	DD6	DD7	DD8
D	DD9	DD10	DD11	DD12	DD13	DD14	DD15	DD16
D	DD17	DD18	DD19	DD20	DD21	DD22	DD23	DD24

Among them, Page A and B represent the data detected by the left sensor; A represents the data detected from the left to the side by the left dimension sensor; B represents the data detected in the middle by the left dimension sensor;

Among them, Page C and D represent the data detected by the right sensor; C represents the data detected in the middle by the right dimension sensor; D represents the data detected from the right to the other side by the right dimension sensor;

The following picture shows the corresponding positions for the data detected and displayed on the four pages, A, B, C and D.

After debugging, press 1 to enable the debugging interface to enter R status; press START/RESET key to exit the debugging status.

2) The second kind of debugging interface

Includes memory data interface, sensor data interface, data interface of detected dimension;

a) Keep pressing ADD key for 3 seconds to enter the memory data interface; press 1 or 2 to switch the two memory data windows; the operation method and display contents for memory interface are the same as 4.4 1) a).

After the debugging, press START/RESET key to exit the debugging status.

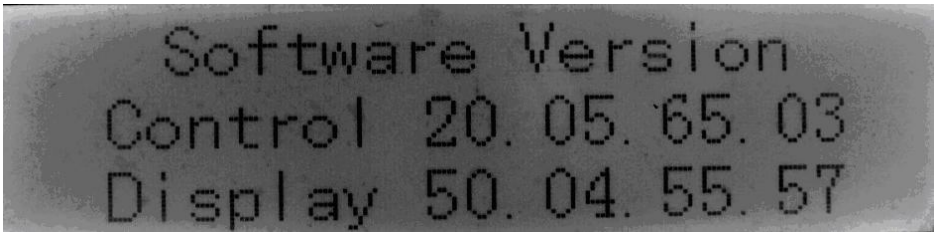
b) Keep pressing MUL key for 3 seconds to enter the sensor debugging interface; adjust corresponding potentiometers on the main control panel to see parameter changes; the operation method and display contents for the sensor debugging interface are the same as 4.4 1) b).

After the debugging, press START/RESET key to exit the debugging status.

c) Keep press 1 for 3 seconds to enter the display interface for dimension sensor; switch among the four pages by pressing 1, 2, 3 and 4 (or 2~5); the operation month and display contents for the debugging interface of dimension sensor are the same as 4.4 1) c).

4.5 Interfaces for special operational functions

a) Keep pressing the 0 key for 3 seconds to display version number, as shown below



Position and meaning of data:

	Software Version			
Control	VD1	VD2	VD3	VD4
Display	VD5	VD6	VD7	VD8

Among them, Control represents version number of control software, Display represents version number of display software; see the meanings of data below:

Data Code	Meaning
VD1,VD5	Critical revision number of version
VD2,VD6	Partial revision number of version
VD3,VD7	Chip code
VD4,VD8	Model code

b) After appearance of error, keep pressing ADD key for 3 seconds to display memory data and view relevant contents.

4.6 Program downloading method (this function is only available for the 4011, 6011 and 6015 motherboards)

1) The machine can perform remote downloading. Required devices: PC computer, DB9 serial cable

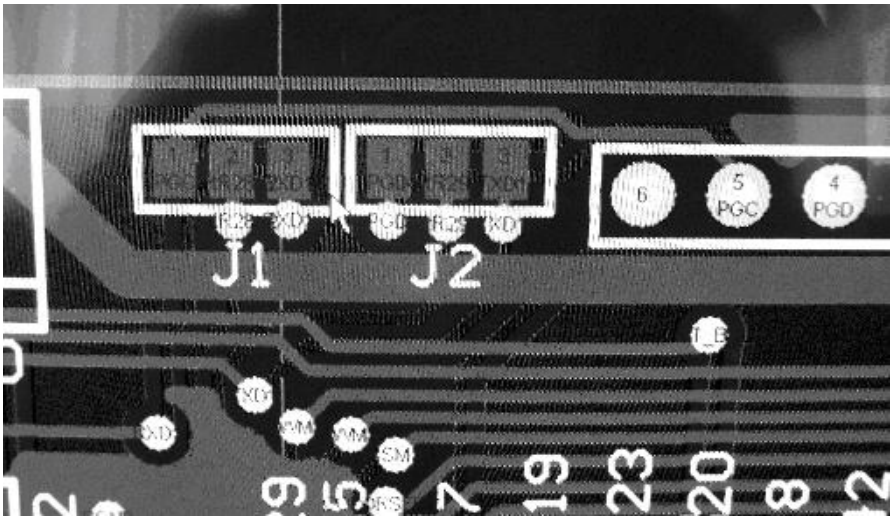
a) Use DB9 serial cable to connect the bill counter with a computer

b) Start the PC and bill counter

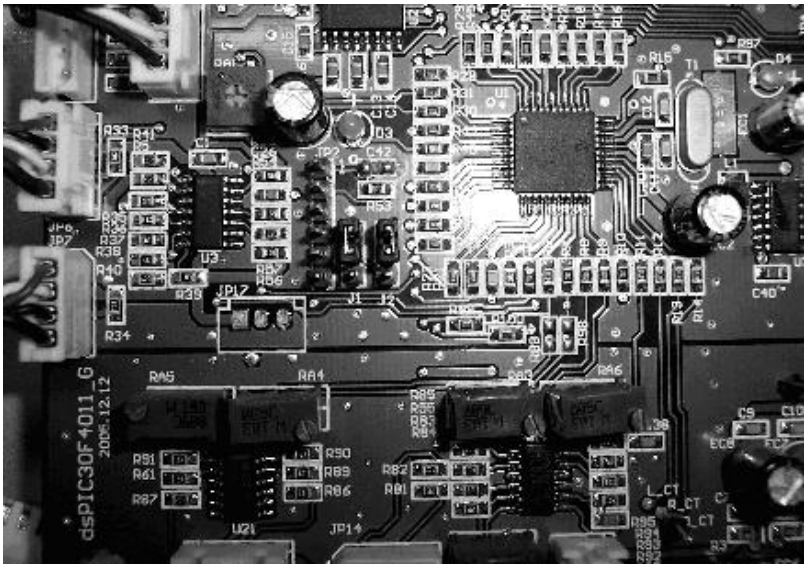
c) Install the download&upload downloading program; installation process as general Windows program

2) Download program: frist check if the jumper on the control panel is in its download status:

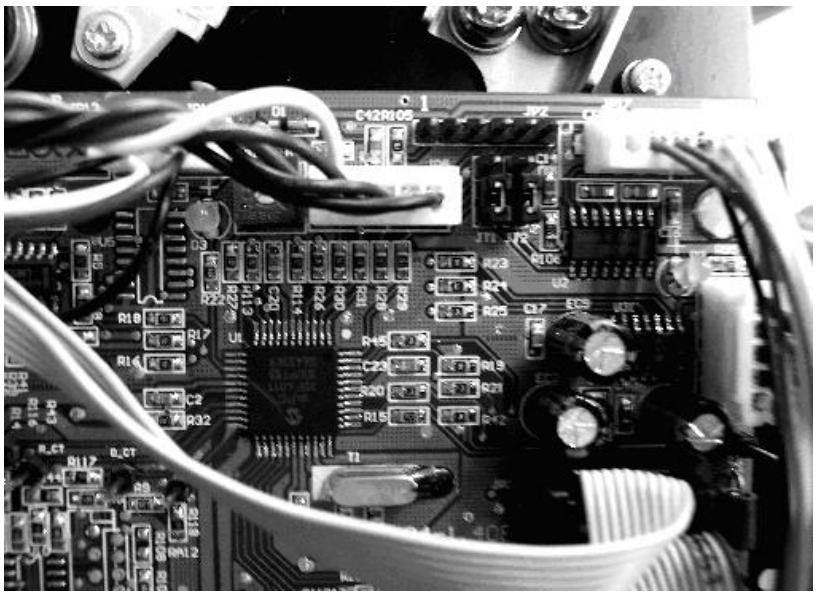
a) dsp4011_D control panel; connect the two bonding pads at the right side of J1 and connect the other two at the right side of J2.



b) Connect the two jumpers of dsp4011_E and dsp4011_On control panels onto them



c) Connect the L04-1.40E/D/C jumpers under them



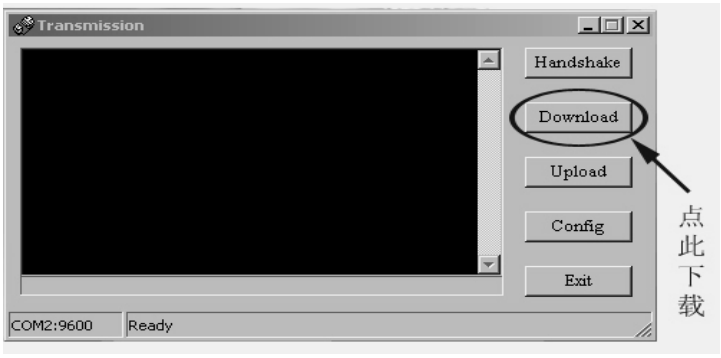
d) Start the DOWNLOAD software

e) Judge if the motherboard program to be downloaded is already downloaded: after empowering the motherboard, if the program indicator to the left keeps blinking, the program is already downloaded; otherwise not.

f) If this batch of motherboard program does not contain downloaded ones, directly proceed the (g) operation; otherwise, as shown on the diagram below, click on the Handshake button.

After successful handshake (the program indicator on the motherboard will go off)

g) As shown below, single click the DOWNLOAD button at the right



h) This dialogue will then pops up. Select the HEX file to be downloaded and then single click the Open botton.

i) Start downloading software

3) Download with a laptop

a) Connect the transmission cable **USB TO RS232 with the PC, as shown below:**

a) Find the COM port (com 3 or 4) assigned for USB by the PC on the Device Manager interface.

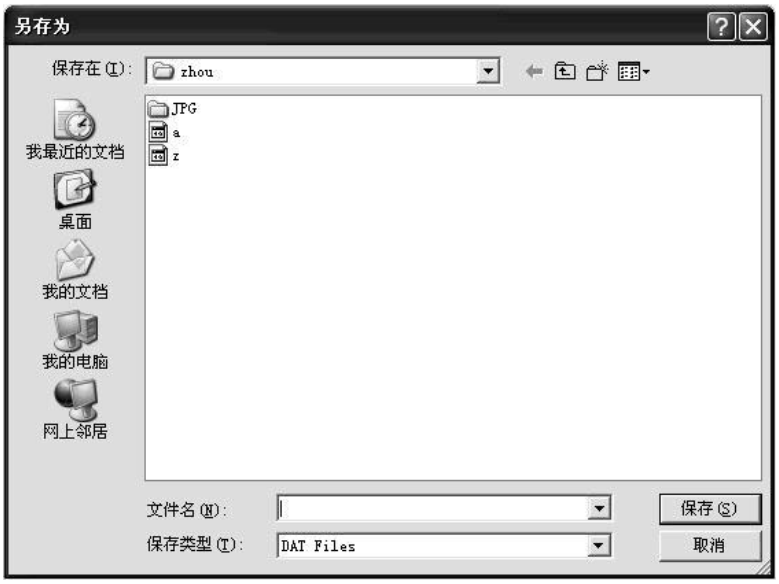
b) Open the Download interface.

c) Click on the Config option.

e) Modify Port option and make it be accordant with the assigned COM port, click OK and then close the Download interface.

f) Restart the software and perform the downloading as 4.6 2).

4.7 Method for uploading data



Upload a file

After clicking the Upload button, the dialogue box above will appear.

When uploading a file, you need to enter or select file name of the file to be uploaded; extension name of the file to be uploaded should be (but not limited to) .DAT; you can select a file name or enter a file name in the Name of File box; when the input file name does not include an extension name, the program will automatically add .DAT to it.

If the file is already there, the system will prompt the following message.

If you select YES, then the existing file will be overwritten and will not be recovered. We advise you to first back up the existing file and then overwrite it unless the file is no longer needed. If the file is not already there, then it will be created. After confirming for all of these, the program will start reading and accessing the built-in program inside the bill counter and store it into the file.

Disassembly Process of the Whole Unit

1) Unscrew the two M4 x 8 bolts on 23, the rear upper cover board; remove 23; give force upward and take off 14, the upper board; unscrew M3 screw on the two side boards 401.407 with screw driver set; loosen the two shields by removing the 4 M4 x 8 bolts; take off the left and right shields 3.13.
2) Unplug all connector plugs or pins on the control panel and take off the control panel.
3) Use screw driver set to loosen the four mounting bolts at both ends of the panel component and take off the

panel component.

4) Loosen the two M4 x 8 bolts under 9, the bill receiving baffle; take off 9, the bill receiving baffle and the bill receiving shield.
5) Remove the two M4 x 8 bolts at both ends of the separation mechanism and take off 24, the separation mechanism.
6) Loosen the 4 M3 x 12 bolts at both ends of the rear-lower cover board; pull out the board; unplug connector plugs connected with the power supply panel; remove the 2 M4 x 8 bolts of the installed transformer on the bottom; take off the power supply component.
7) Remove two M4 x 8 bolts of the installed small motor on the bottom; unplug connector plugs on the power supply panel, which are connected with the small motor; take off 8, the bill receiving wheel.
8) Use a flat screwdriver to remove the E ring at both ends of the feeding component; take off 27, the synchronous belt; remove the small auxiliary wheel; take off the feeding component.
9) Remove the M5 bolt at the left end of 34, the lower conveyance wheel; take off tachometer disc; take off 27, the synchronous belt; remove the small belt wheel.
10) Remove the belt wheels and E rings at both ends; remove the bolts at both ends of the conveyance baffle; remove the bolts at both sides of the lower baffle; remove all the other transmission shafts.
11) Remove the other installation parts.

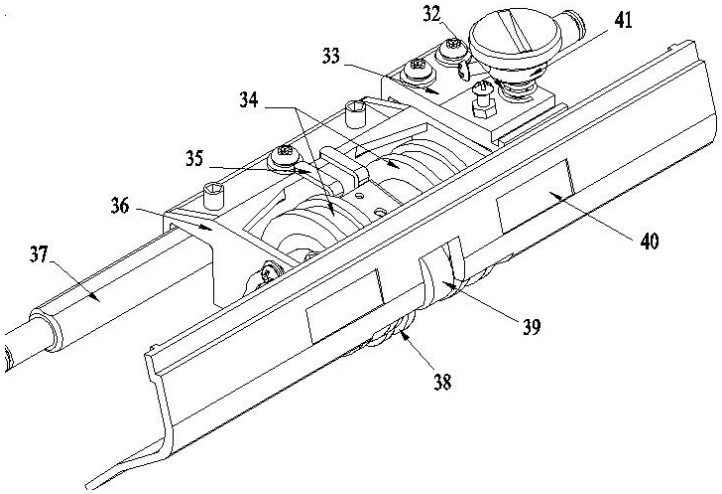
Installation Requirements for the Mechanical Part and Adjustment of Parameters

6.1 Installation and adjustment of the bill separating mechanism (see Figure 9 and 10)

The function of 24, the bill separating mechanism, is to separate a deck of bank notes into single ones and send them into the machine. This is realized by the joint effect of the intermittent friction generated by 26, the rotating friction wheel, and the direction-reversed resistance generated by 34, the separating wheel.

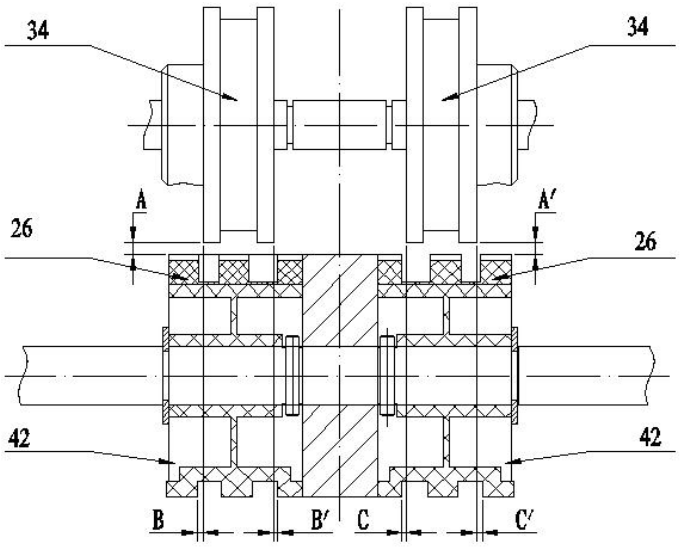
In process of the work, the rubber part of 26, the friction wheel, and B, C, the side gaps of 34, the separating wheel, will affect the friction thrust; therefore, in process of the debugging, it's required that the gap of 26, the friction wheel, and 34, the separating wheel, should be equal, namely, B=B' and C=C'.

If process of the work, the gaps of 26, the friction wheel, and 34, the separating wheel, normally, A and A', will affect the separating resistance; if the distances of A and A' are unequal, it will cause no lean and revulsion of a bank note. Therefore, the gaps (the bill feeding gate, 17) formed by the rubber-free part of the two sets of friction wheels, 26, and 34, the separating wheel, should be equal, normally, A=A'.



32.adjusting spring	35.spacing board	38.pinch wheel part	41.adjusting bolt
33.bracket adjusting base	36.bracket die cast	39.auxiliary pinch wheel part	
34.separating wheel	37.bracket fixed axis	40.upper baffle	

Figure 9 Position Drawing of 24, the bill separating mechanism



34. separating wheel	26.friction wheel	42.rotation testing wheel

Figure 10 Position and Gap of the Friction Wheel and 34, the separating wheel

Installation and adjustment of 24, the bill separating mechanism

Installation and adjustment method:

Alignment of 24, the separating mechanism: loosen the fixed bolts of the spacing rings at the left of the fixed axis to 24, the separating mechanism; move 24 leftward and rightward and make sure the whole parts are in good alignment and then fasten and fix them. Adjustment of the side gaps of 34, the separating wheel and 26, the friction wheel:

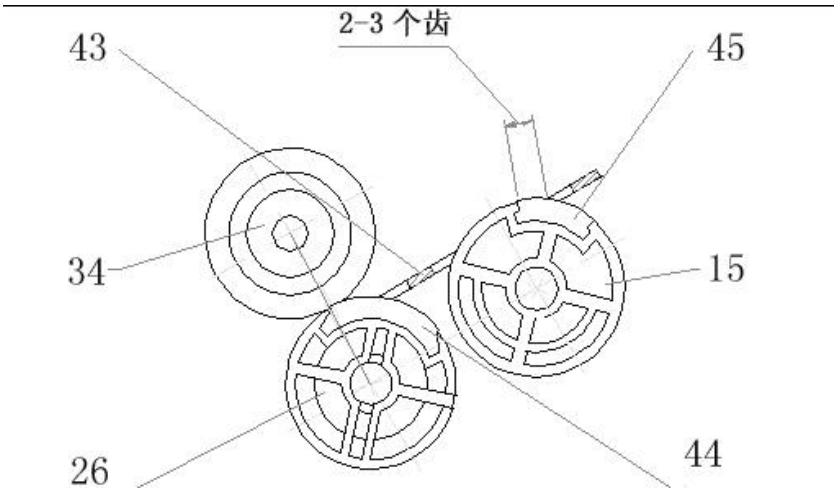
loosen the two bolts of 34, the fixed separating wheel; move 34 leftward and rightward and make it that the rubber part of 26 equals to the side gap of 34; and then fix and fasten them. The left and right gaps of the "bill feeding gate, 17" are the same; turn the adjustment knob for bill thickness to enable the "bill feeding gate, 17" to let exactly one bill to go through; test status of the left and right gaps; base on test result, loosen the bolts on the fixed bracket (normally loosen 3 and the fourth stay still), knock gently until it meets installation needs; finally, fix and fasten the bolts; certain level of skill is required for doing the work above, it requires many times of tests and adjustment.

6.2 Synchronization of the Friction Wheel and Feeding Wheel

The function of 15, the feeding wheel, is to provide an additional friction thrust to 24, the bill separating mechanism and hence enable the bill to enter 24, the separating mechanism in good order. The additional friction thrust is realized by the block rubbers on 15, the feeding wheel. If move action time of the block rubber forward, the additional friction thrust effect will become larger; if the time is delayed, the additional friction thrust effect will become smaller. Therefore, position of the block rubber functions to perform fine adjustment to the friction thrust of the bill rubbing mechanism.

Installation and adjustment method:

Keep turning 15, the feeding wheel, along the bill incoming direction, until the highest point from Point A to surface of 43, the bill feeding platform, has been reached; and the distance between the tangent point of 26, the friction wheel and 34, the separating wheel, and the rubber part of 26, the friction wheel, becomes 3~5mm; this can be achieved by adjusting position of the serrated belt. 2~3 teeth



43.bill feeding platform 26 friction wheel 15 feeding wheel
34 separating wheel 44 friction rubber 45 feeding rubber

Figure 11 Position Drawing of 26, the Friction Wheel and 15, the Feeding Wheel

6.3 Positioning of the "Bill Feeding Gate" Adjustment Knob (see Figure 9)

Installation and adjustment method:

Fix the positioning bolt on the adjustment knob in advance; adjust the gap of the "bill feeding gate, 17" with a

bank note; when a bank note passes through the gate, obvious resistance should be felt; and then loosen its fixed bolts; position the small dot of the knob at the highest point and fasten it. After installation of 14, the upper cover board, if the position has some change, re-adjustment needs to be done.

Working Principle of the Electrical Part and Requirement of its Installation and Debugging

In this part of the electrical schematic diagrams, the code begins with "M-" means this component locates in the control panel section; the one begins with "D-" means this component locates in the display panel section; the one begins with "P-" means this component locates in the power supply panel section; the one begins with "UVP-" means this component locates in the UV power supply panel section; the one begins with "S-" means this component locates in the sensor section.

7.1 Bill feeding sensor

1) Description of Working Principle

The stacker sensor is installed on the bill feeding platform, which is used for detecting placement status of the bank notes on the bill feeding platform. It's a reflective light chopper formed by an infrared illumination and an infrared receiver. Turn on of the infrared illumination is controlled by the V_I modulation signal; the infrared receiver identify if any bank note exists on the bill platform by detecting the status when the infrared modulation light sent out by the detecting illumination is reflected by the bill.

2) Electronic schematic diagram and oscillogram

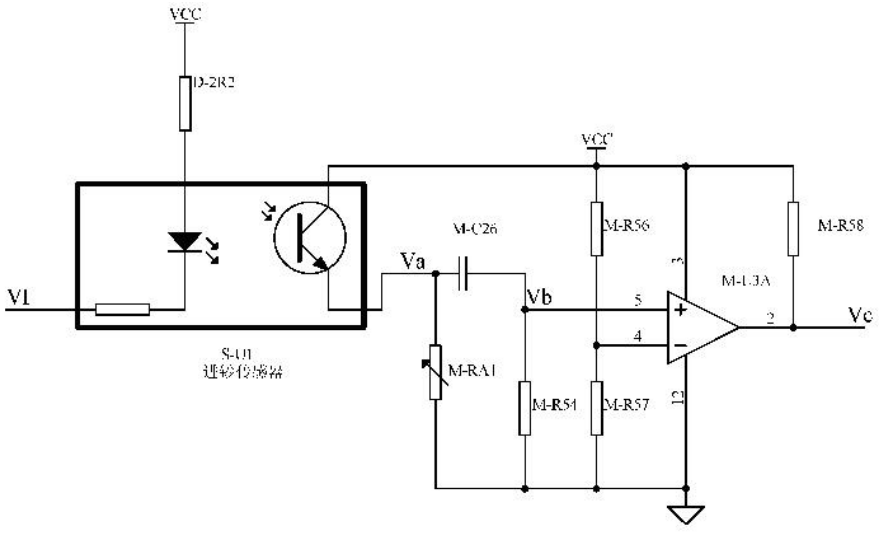
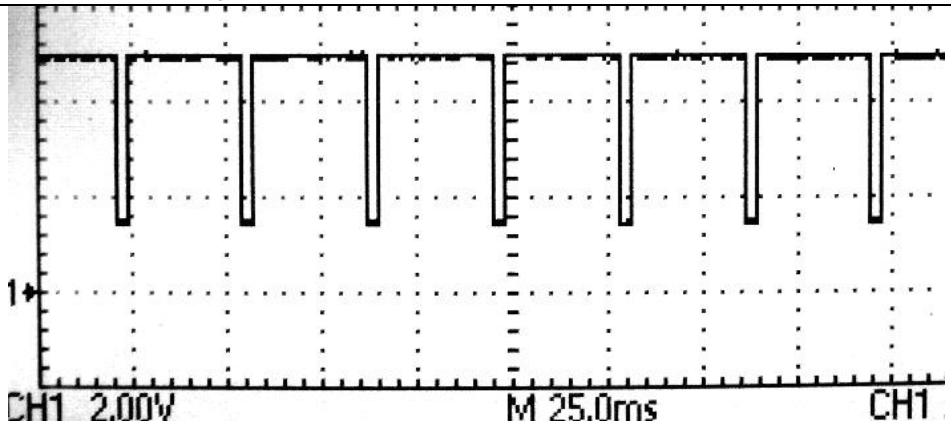
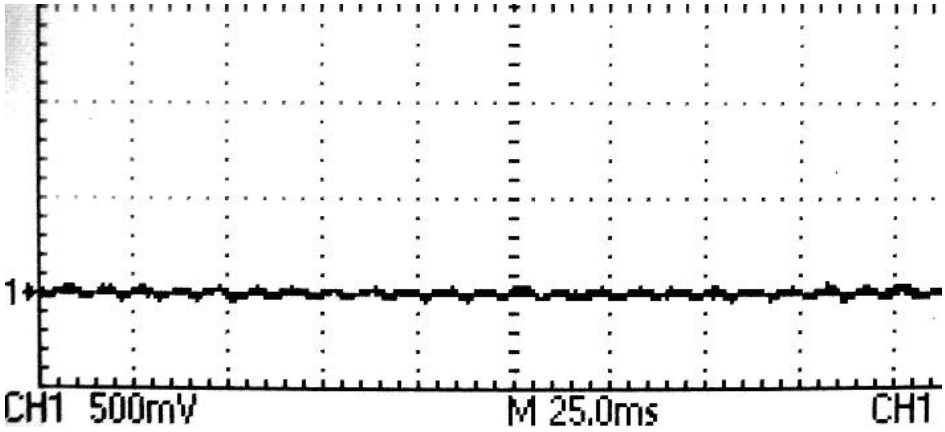


Figure 12 Electric Schematic of the Bill Feeding Part

VI



Vb



When there's no reflection from bank note Vb≤80mV

Vc

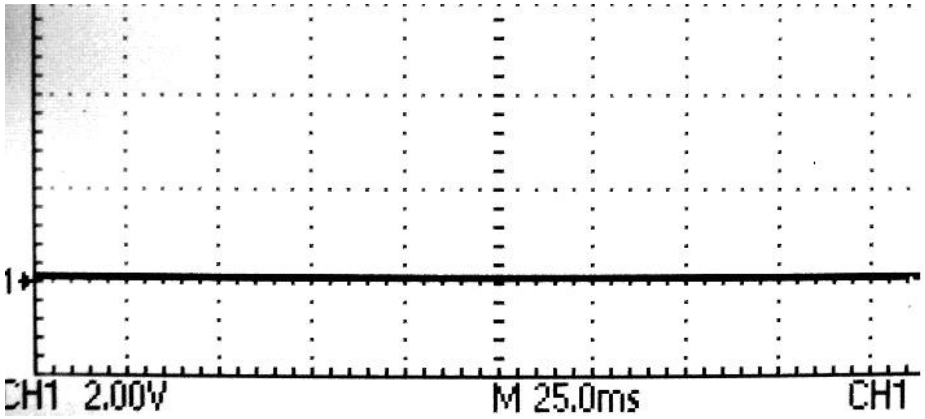
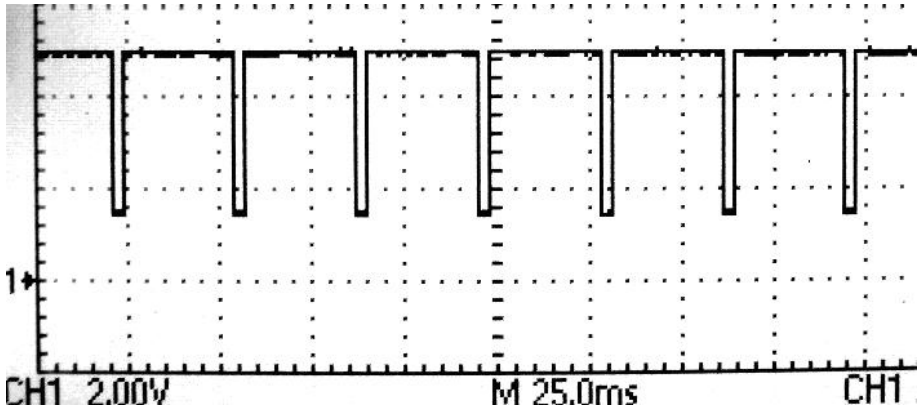
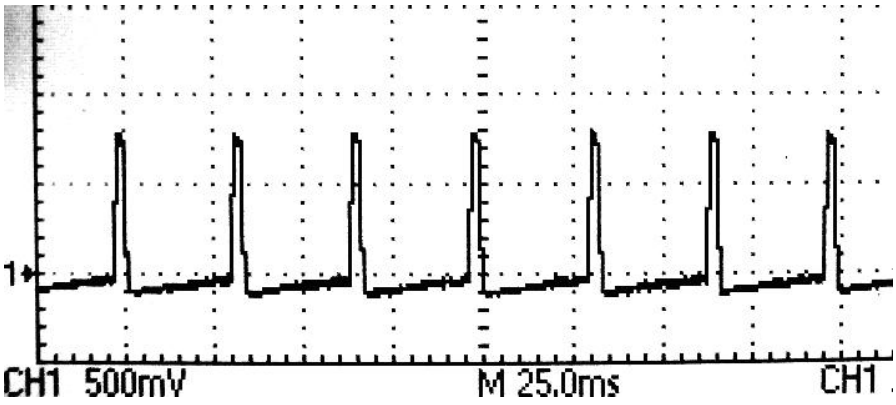


Figure 13-1 Waveform for each point when no reflection from bank note

VI



Vb



Vb has the peak value of 750-800mV when use black object for reflection

Vc

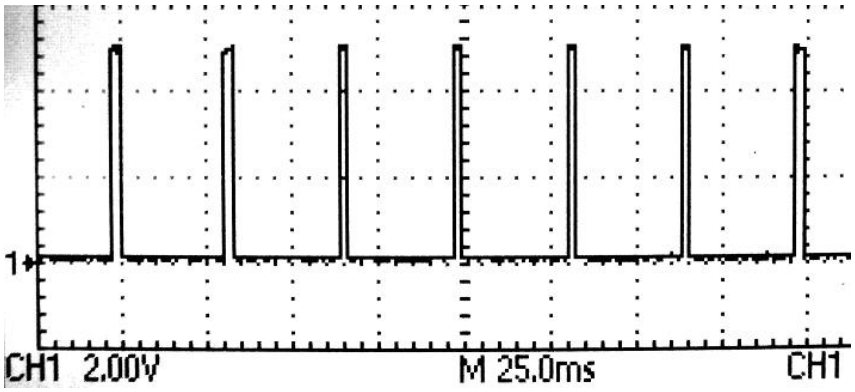


Figure 13-2 Waveform of each point for reflection by black object

Figure 13 Waveform of the bill feeding part

3) Debugging

A. Debugging instruction

Turn the potentiometer RA1 in clockwise direction and Va, the voltage generated by photo current should increase; Turn the potentiometer RA1 in clockwise direction and Va, the voltage generated by photo current should decrease and Vb should change accordingly as Va changes.

B. Debugging Steps

a) First turn the potentiometer RA1 to the end in anti-clockwise direction; in irradiation of strong light, when the stacker sensor is not covered, fluctuation quality of the reflection signal received by the sensor, Vb should be ≤80mV. At this moment, the machine can't start.

b) When placing a wholly black object onto the sensor surface, adjust RA1 potentiometer and make the peak value of the reflection signal generated by the sensor, Vb be 750~800mV; now the peak value of Vc should be ≥4.3V and the machine should be normally running.

c) If test with bank notes, it should run normally.

7.2 Left/Right Counting Sensors and Left/Right Penetration Sensors

1) Description of Working Principle

The left and right counting sensors are a kind of infrared sensor. They're located on both sides of the lower conveyance wheel. They're for detection of status signal of bank notes. The left and right counting sensors consist of two pairs of infrared emission and receiving sensors, which are respectively installed at both sides of the bill conveyance path; when a bill passes through a counting sensor, the counting sensor will have parameter change to generate change of electric signal and hence be able to perform bill counting and discrimination of overlapping bills. The left and right penetration sensors are absolutely the same sensors as the left and right counting sensors. They're installed in the upper part of the path at the same horizontal position as UV. Its function is to detect the position signal when a bank note passes through UV sensor. It can also be used to detect the penetration characteristic of a bank note.

2) Electric schematic diagram and oscillogram

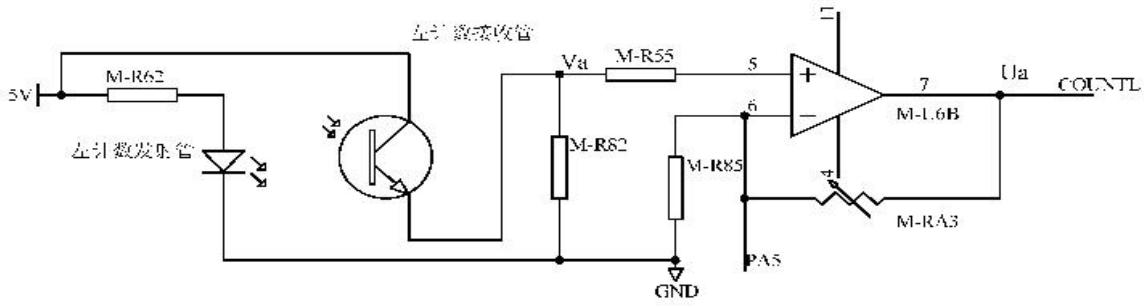
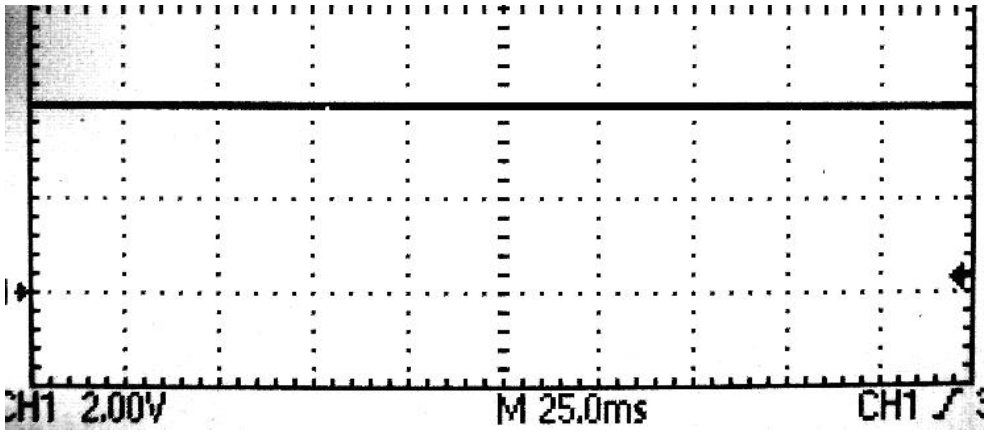
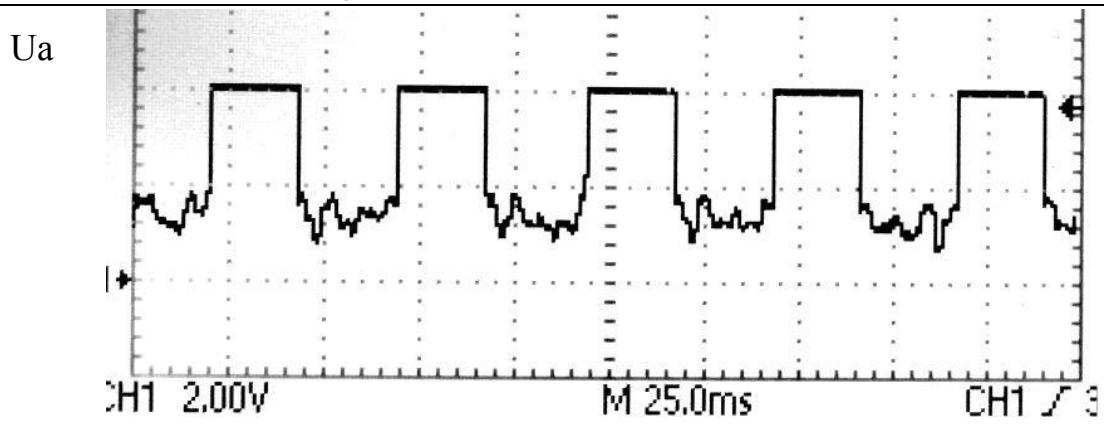


Figure 14 Electric Schematic of the Infrared Sensors

Ua



Waveform when no passing through of bank note



Waveform when there's continues passing through of bank note

Figure 15 Output oscillogram for the infrared sensors

3) Installation requirement

Adjust installation positions of the left and right counting sensors and penetration sensors and make the output voltage of the receiving tube be Va≥4V when no bank note passes through any counting sensor.

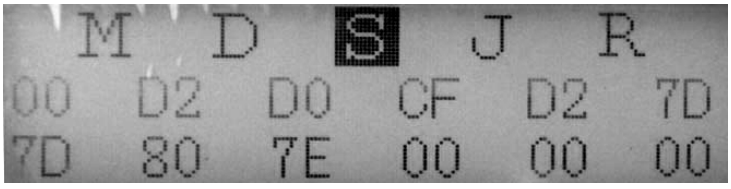
4) Debugging

A. Debugging instruction

Adjusting the RA3 potentiometer can change sensitivity of the left counting sensor; clockwise to decrease and anti-clockwise to increase;

B. Debugging steps

a) Enter the sensor debugging interface shown below according to the description at 4.4.b



b) Use standard 80g white coated art paper and place it at a corresponding position which interact with the path of the counting sensor; and then make base line of the paper and the base line of the lower conveyance baffle at the same surface and at the same level; and then adjust corresponding potentiometers to make 3C or 3D the data of SD2, SD3, SD4 and SD5.

c) After full adjustment, take out the paper and then press the 1 key for few times until the R option is selected and then press START/RESET key to exit.

Note: the parameters above (3C or 3D) has something to do with specification of the coated art paper; in actual operation, you can test the paper to be tested on an adjusted machine and identify its testing value and then use this testing value as a

benchmark for adjustment of the machine to be done.

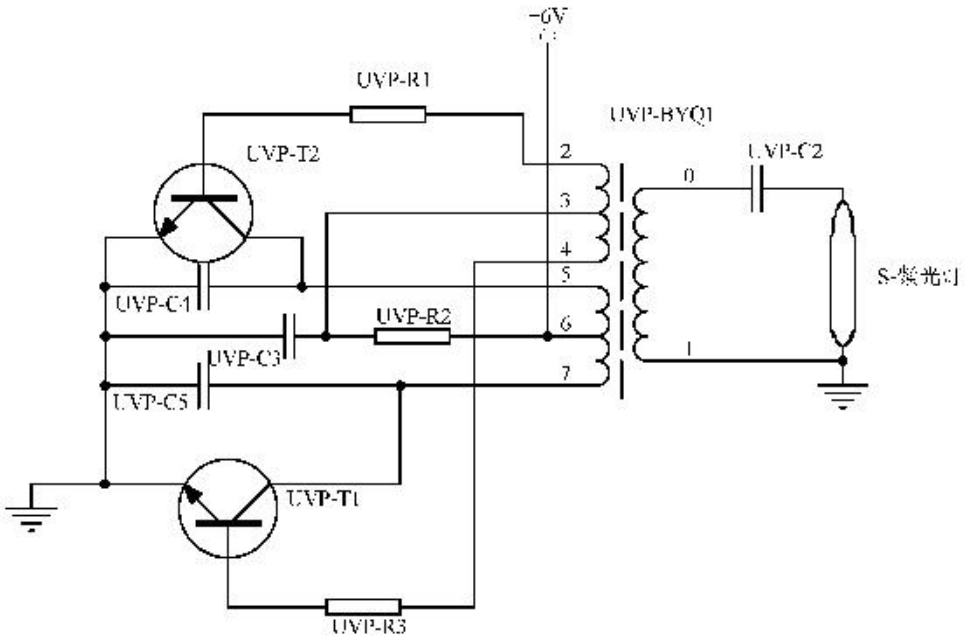
The debugging method for the two pairs of penetration sensors and the infrared counting sensors on the other side are the same.

7.3 Fluorescence sensor

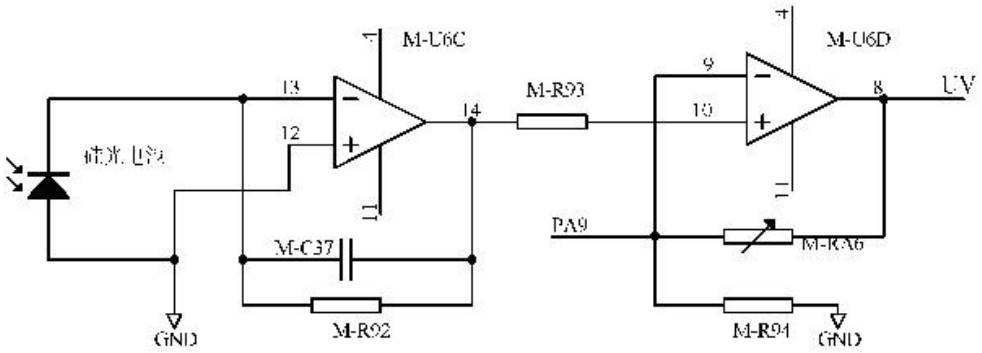
1) Description of working principle

The Fluorescence sensor locates in the middle of the lower conveyance wheel or the middle of dimension sensor. It's for identifying the fluorescence reaction of a bank note when it's in a UV light. It consists of an UV light emission dvice and a fluorescence receiving device. UV light emission device is oscillated via the 800V/50KHZ DC current generated by its step-up oscillatory circuit, which activates the UV light to work. The UV light is installed in a confined space to emit ultraviolet light. The fluorescence receiver device consists of multi-layer glass and silicon photo cell. Multi-layer glass forms an optical filter; the silicon photo cell detects fluorescence signal generated from a bank note.

2) Electric schematic diagram and oscillogram

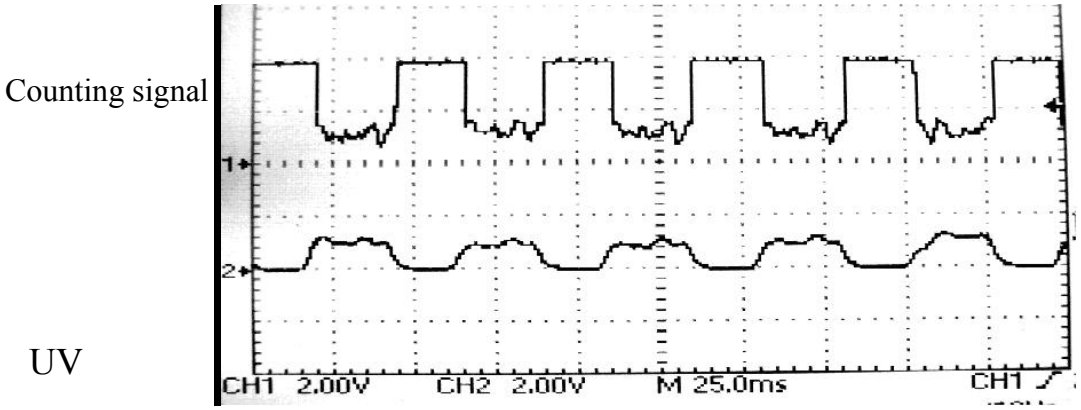


Electric schematic for UV emission

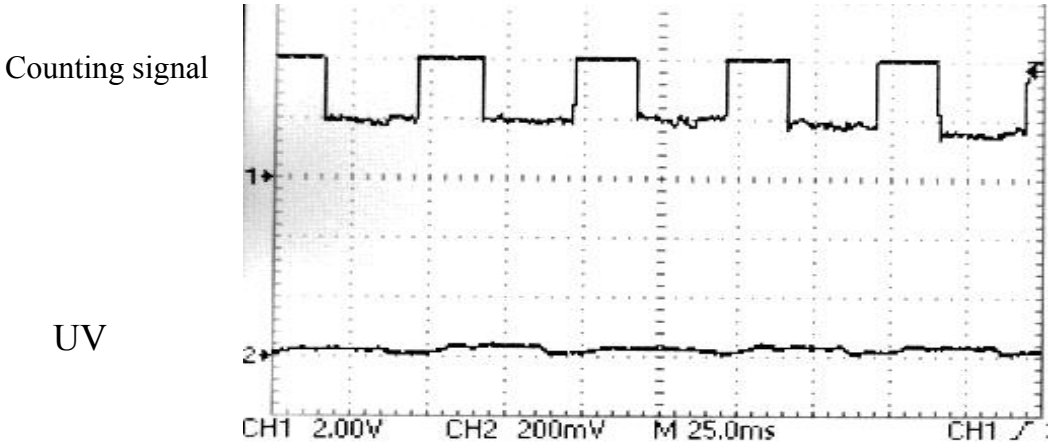


Electric schematic for fluorescence receiving

Figure 16 Electric schematic of the fluorescence receiving part



Waveform when fluorescence reflection exist (2 is the waveform when sorting and counting the testing paper which has a little fluorescence characteristic)



Waveform when no fluorescence reflection (2 is the waveform for counting the real bank notes)

Figure 17 Waveform change for fluorescence test

3) Debugging

A. Debugging instruction

Adjusting the RA6 potentiometer can change the fluorescence reflection sensitivity of the machine; clockwise to decrease

and anti-clockwise to increase.

B. Debugging steps

a) Adjust the fluorescence grade into Grade 1 according to the instruction in 4.3.2.

b) Use bank notes and let the bill counter count 500 pieces and the wrong reporting of fake note should be within 1 to 3 times. If it's larger than 3 times, you should adjust the RA6 fluorescence to lower its sensitivity. If there's no wrong reporting, increase the sensitivity. Recount the bank notes until it has met the requirements.

c) Adjust the fluorescence grade into Grade 6 and there's should be no wrong reporting for counting 1,000 bank notes.

d) If there's any wrong reporting, lower the sensitivity; repeat above steps until it has met the requirements.

7.4 Bill Receiving Sensor

1) Description of working principle

The bill receiving sensor locates inside the bill receiving bracket, which is for detecting if there's any bank note exist on the bill receiving platform. It consists of infrared emitting diode and infrared receiving sensor. The infrared emitting diode generates infrared signal and the infrared receiving sensor receives the signal sent out from the infrared emitting diode.

2) Electric schematic diagram and oscillogram

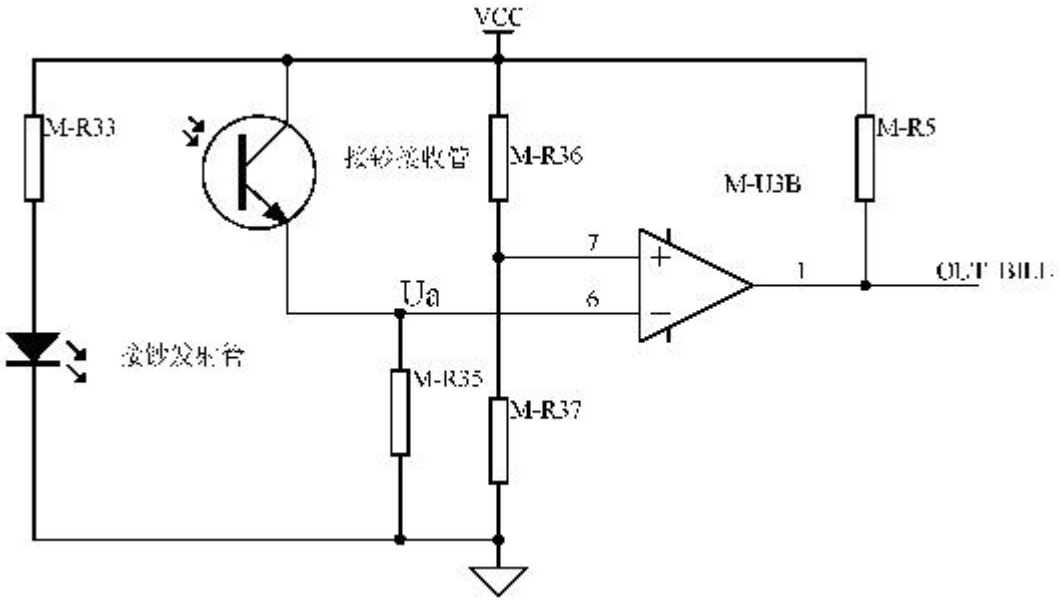
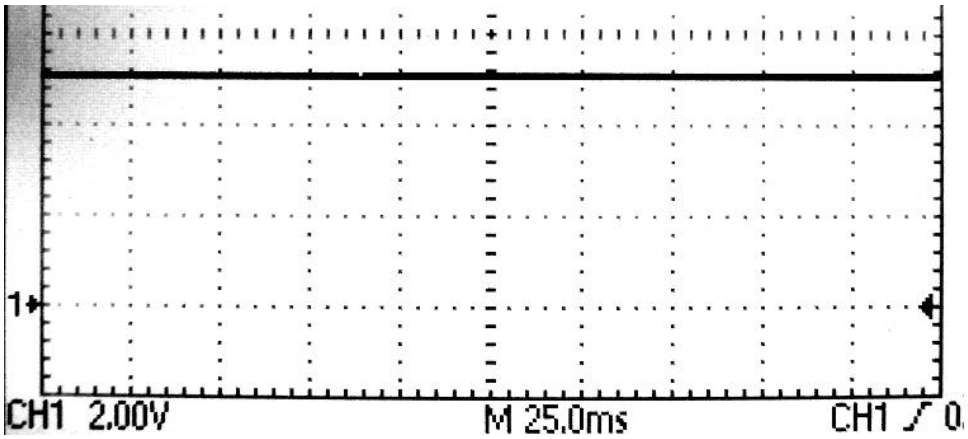


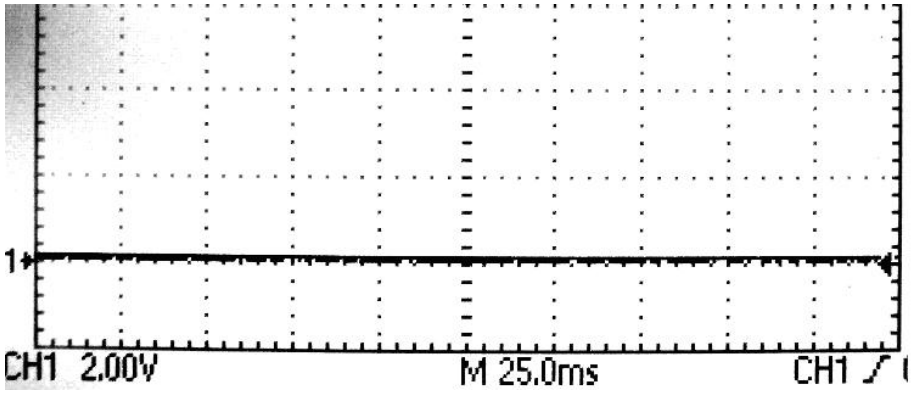
Figure 18 Electric Schematic for the Bill Receiving Part

Ua



Ua>4.3V when there's no bank note

Ua



Ua<0.3V when there is a bank note

Figure 19 Change of Waveform for Bill Receiving

3) Installation requirement

When being covered with a bank note, $U_a > 4.3V$; when being not covered, $U_a < 0.3V$.

7.5 Speed sensor

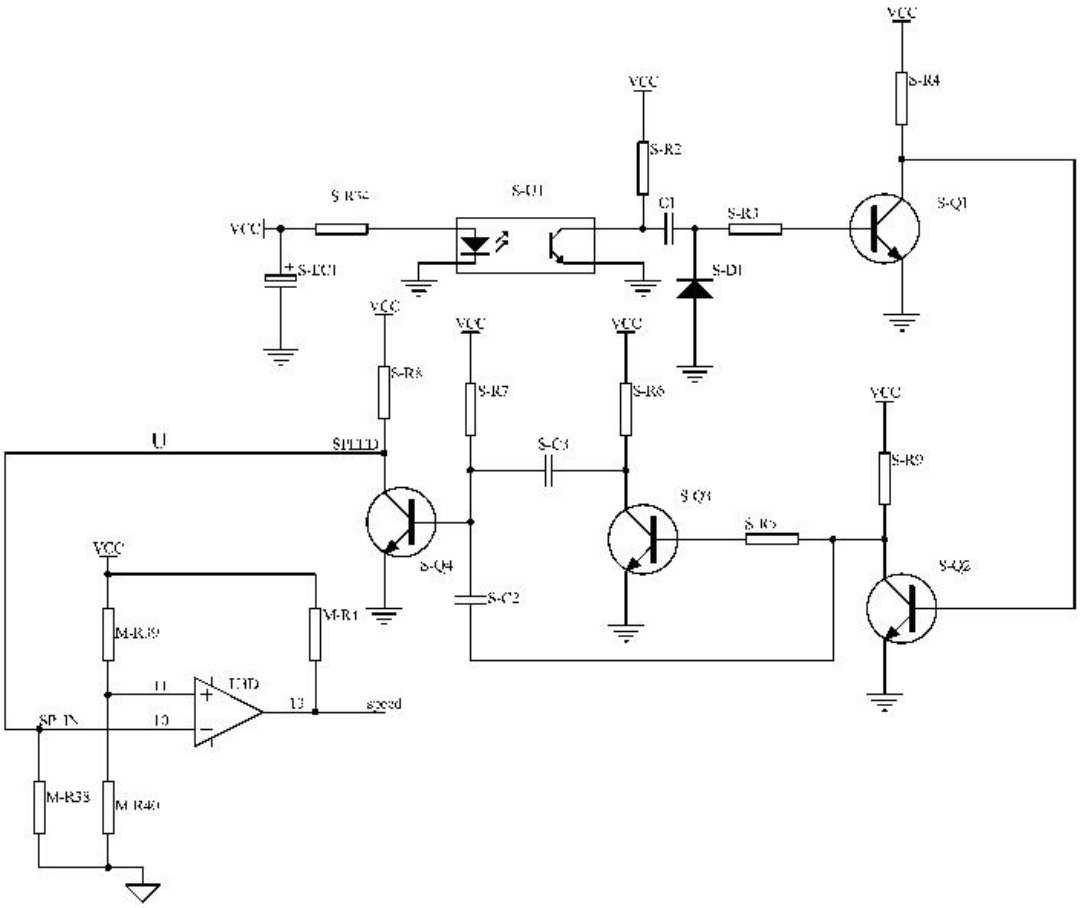
1) Description of working principle

The speed sensor locates next to the tachometer grating at the left end of the lower conveyance axis. It's for detecting speed of the bill counter. It consists of infrared emitter and receiving germinate transistors. Grating of the tachometer disc, along with rotation of the machine, makes parameters of the speed sensor change periodically and hence detect speed of the bill counter.

There are two configurations for speed sensors according to different machine model. The first is a tachometer disc of 19 teeth and the other 157. The 19-tooth tachometer disc generates signal of rotation speed along with running of the matching. It's for testing the rotation status of the machine. The 157-tooth tachometer disc generates sync pulse of rotation speed along with running of the machine, which goes through a doubling circuit, and then further increase number of sync

pulses. This is for precise measurement and positioning of status of a bank note.

2) Electric schematic diagram and oscillogram



U

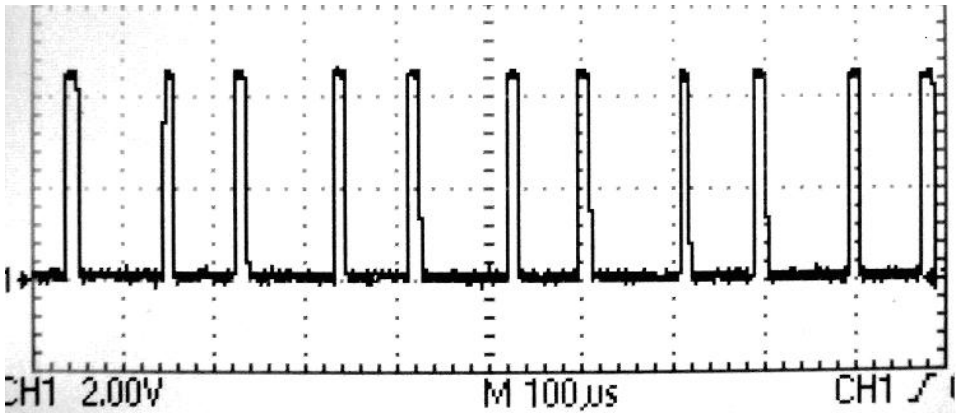


Figure 20 Electric schematic and oscillogram of the 157-tooth tachometer disc

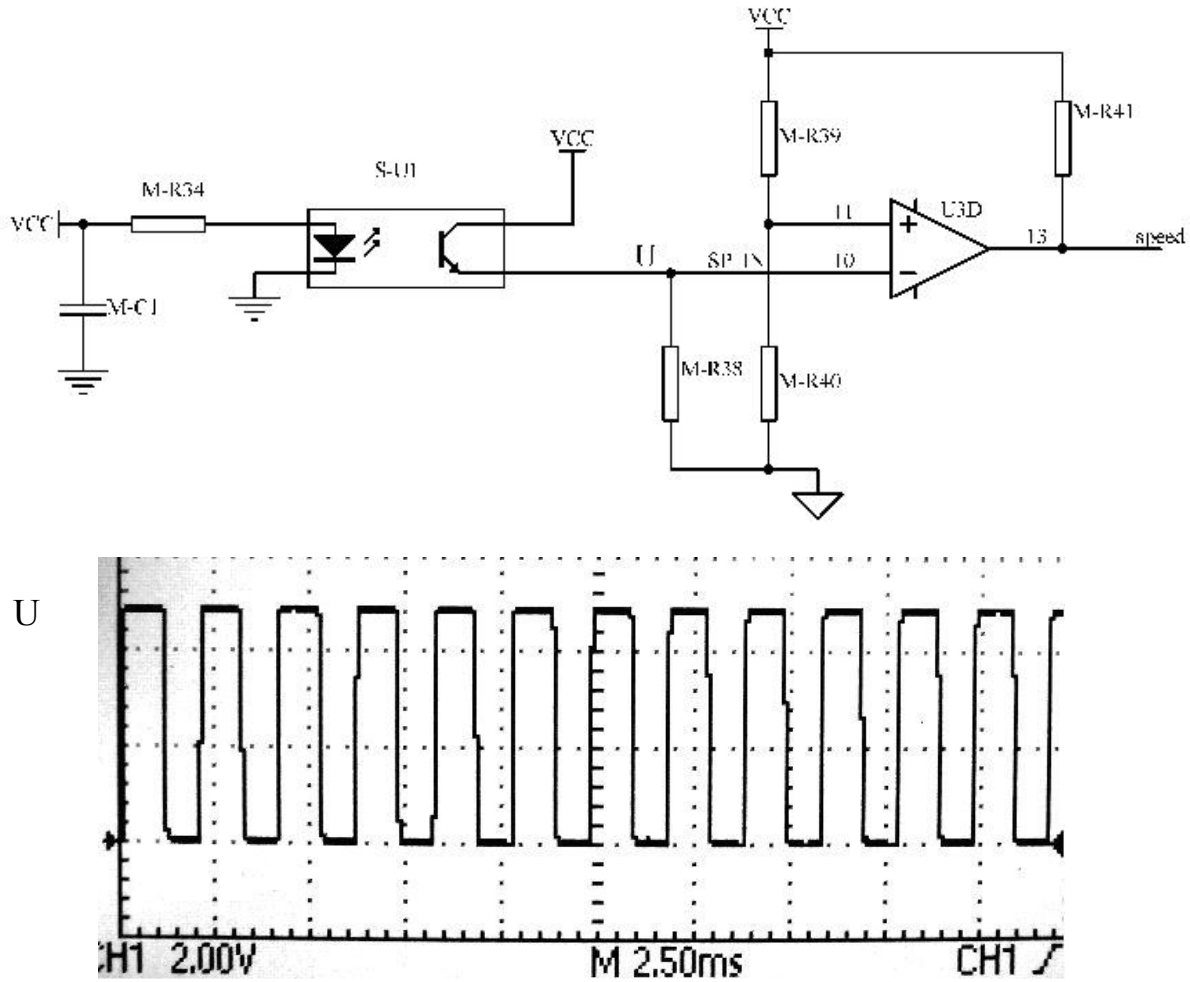


Figure 21 Electric schematic and oscillogram of the 19-tooth tachometer disc

3) Installation requirement

When the tachometer grating is not covering the sensor, U＞4.3V (normally, the peak value of U on the work flow should be ＞4.3V); when the tachometer grating is covering the sensor, U＞0.3V (normally, the valley value of U on the work flow should be ＞0.3V);

7.6 Magnetic ink sensor

1) Description of working principle

The magnetic ink sensor is a kind of magneto-dependent sensor, which is installed under the component of the lower conveyance wheel. It's for detecting ink characteristic of designated position on a bank note. When a bank note with magnetic ink goes through a sensor, there will be a tiny change for the output signal of the magnetic ink sensor; the signal of such change will be amplified through the amplifying system and transmitted to the detection system. The detection

system will judge weather it's a real bank note or note according to the signal characteristic of the magnetic ink.

2) Electric schematic and oscillogram

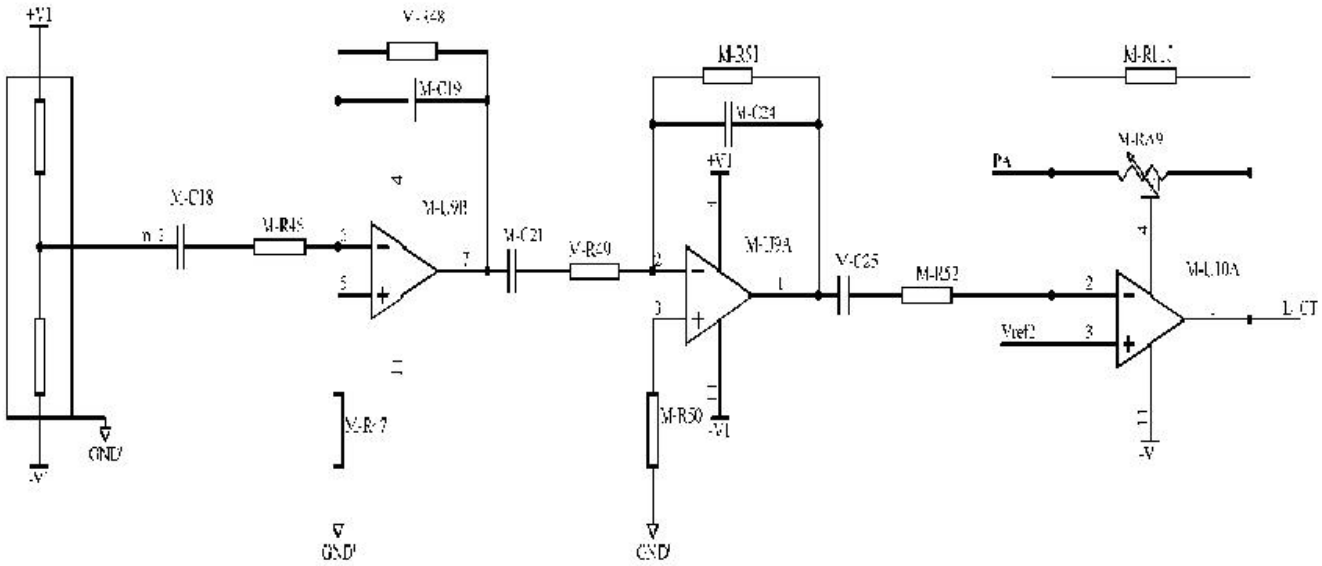
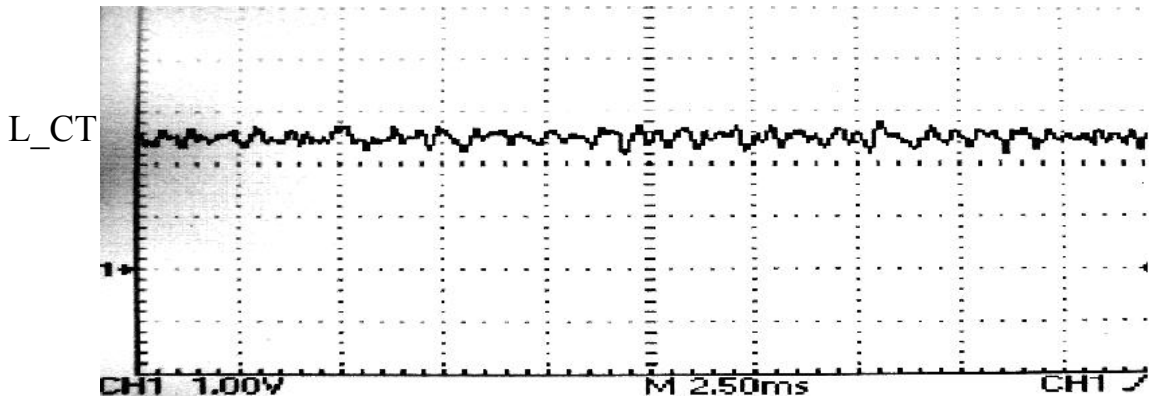
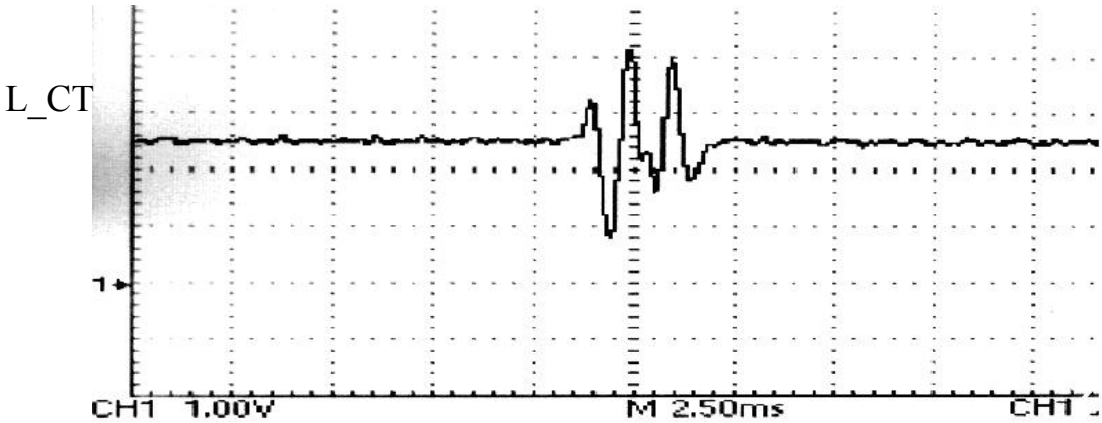


Figure 22 Electric schematic of the magnetic ink detection part



Noise signal when there's no paper



Waveform when a bank note with magnetic ink goes through the magnetic sensor

Figure 23 Waveform change for magnetic ink detection

3) Installation requirements

a) The gap between surface of the sensor and pinch rim of the magnetic head should be 0.1~0.15m. Test it with a bank note and obvious resistance should be felt.

b) When there's no paper pass through the sensor, output of L_CT should have noise signal only and the noise ≤200mV.

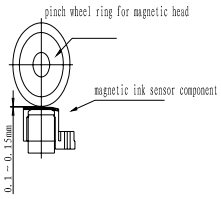


Figure 24 Schematic diagram of assembly for the magnetic ink sensor

4) Debugging

A. Debugging instruction

a) Turn RA9 in clockwise direction and reduce sensitivity of magnetic detection of the left magnetic ink sensor; turn in anti-clockwise direction and increase the sensitivity.

b) When there's paper with magnetic ink pass through the sensor, the waveform change for L_CT output will be shown as Figure 23. When there's no paper with magnetic ink pass through the sensor, there will be no magnetic signal for the L_CT output but noise.

B. Debugging steps

a) First adjust the detection sensitivity of the magnetic ink sensor to the lowest point; and then use a testing bank note without magnetic ink to test the bill counter and there's should be no alarm; after that, slowly increase the detection sensitivity of the magnetic ink sensor until the alarm for bank note with magnetic ink activate and the machine should stop then.

Remark: the installation and debugging method for the other side of the magnetic ink sensor is the same.

7.7 Safety line detection sensor

1) Description of working principle

Safety line detection sensor is also a kind of magnetic detection sensor. It's installed in the lower part of the lower conveyance baffle. It's for detecting the safety line of a bank note or the magnetic characteristic of the middle area of a bank note. When a bank note with magnetic ink passes through the sensor, there will be a tiny change in output of the

sensor and the signal for this change will be amplified by the amplifying system and sent to the detection system. The detection system will judge if the bank note is real or fake according to characteristic of the signal from the magnetic ink.

2) Electric schematic diagram and oscillogram

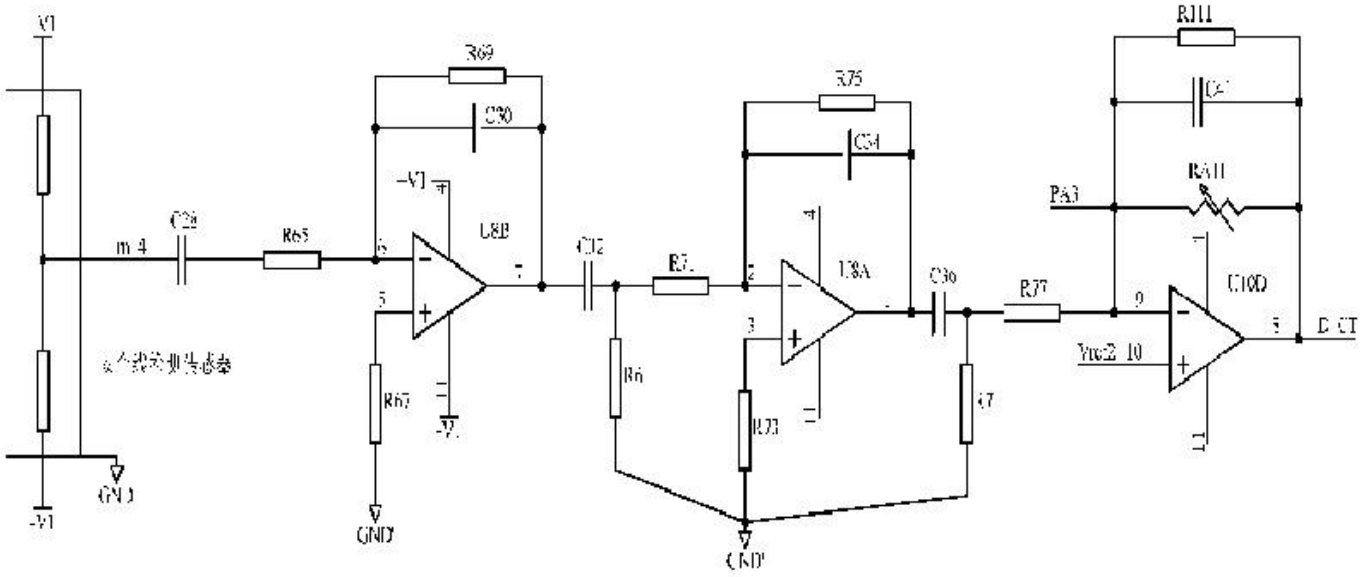
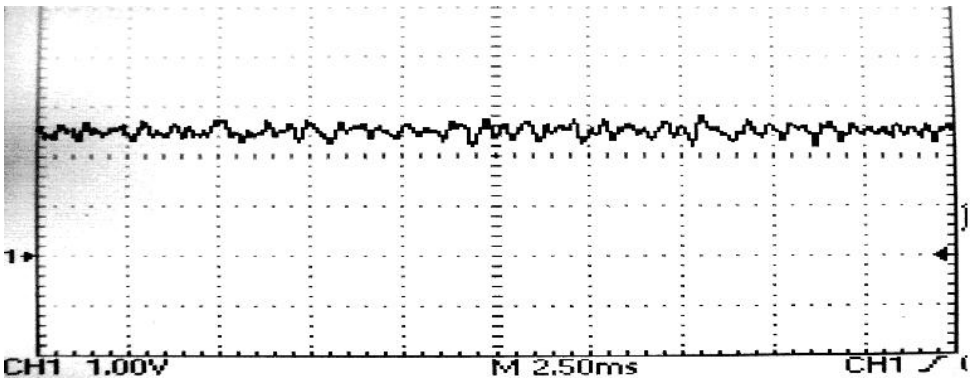


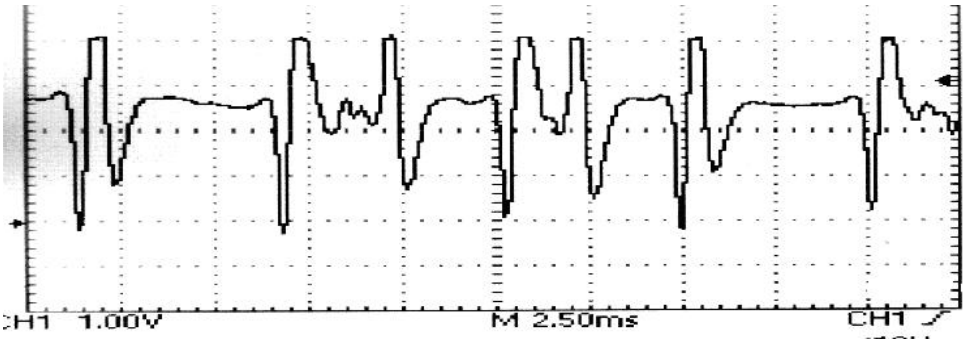
Figure 25 Partial Electric Schematic of the Safety Line Detection

D_CT



Noise signal when there's no paper

D_CT



Waveform for testing of 200 Euros

Figure 26, Partial Waveform Change for Safety Detection

3) Installation requirement

a) The gap between surface of the sensor and pinch rim of the magnetic head should be 0.1~0.15m. Test it with a bank note and obvious resistance should be felt.

b) When there's no paper pass through the sensor, output of L_CT should have noise signal only and the noise ≤200mV.

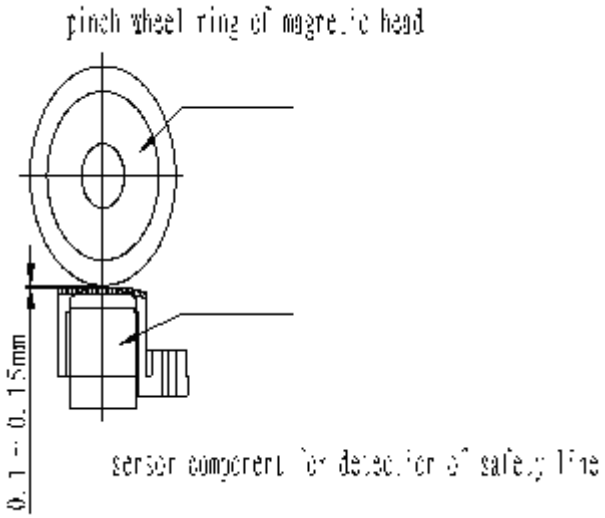


Figure 27 Schematic Diagram of Assembly for Safety Line Detection Sensor

4) Debugging

A. Debugging Instruction

a) Turn RA11 in clockwise direction to lower sensitivity of the safety line detection; turn RA11 in anti-clockwise direction to increase the sensitivity.

b) When a bank note with magnetic ink passes through the sensor, the D_CT output will have the change shown as Figure 26. When a paper without magnetic ink goes through the sensor, there will be no magnetic signal for the D_CT output but noise.

B. Debugging steps

a) Fist decrease sensitivity of the safety line detection; keep decreasing until wrong reporting happen when test with a bank note with safety line.

b) Increase sensitivity of the safety line detection; keep increasing until the wrong reporting disappears. After that, use the bill counter to count bank notes without safety lines and the counter should alarm.

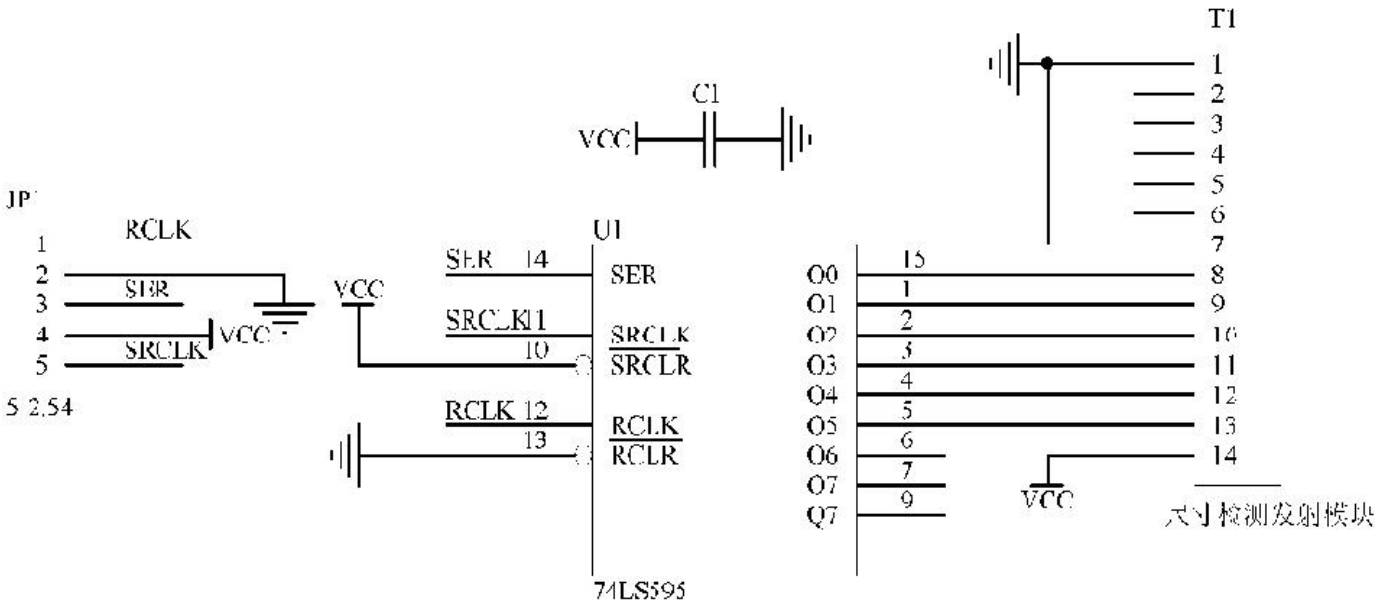
c) Repeat these for many times according to a) b) until a real bank note can pass through without alarm and alarm when a fake one passes through.

7.8 Dimension Detection Sensor

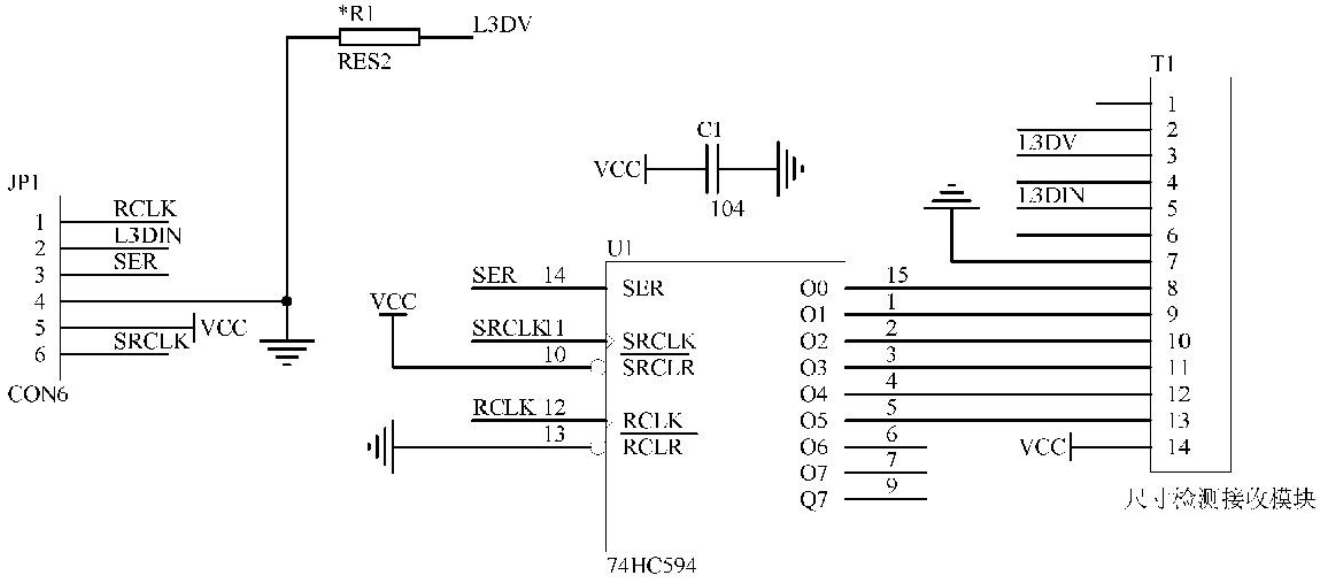
1) Description of working principle

The dimension detection sensor is installed on both sides of the conveyance path. It's for verifying dimension of a bank note. It consists of an emitter sensor and a receiver sensor. The emitter sensor sends out light signal through infrared illumination array, which penetrates a bank note or directly arrives in the receiver sensor. The detection system judges dimension of the bank note according to characteristic of the signal it received.

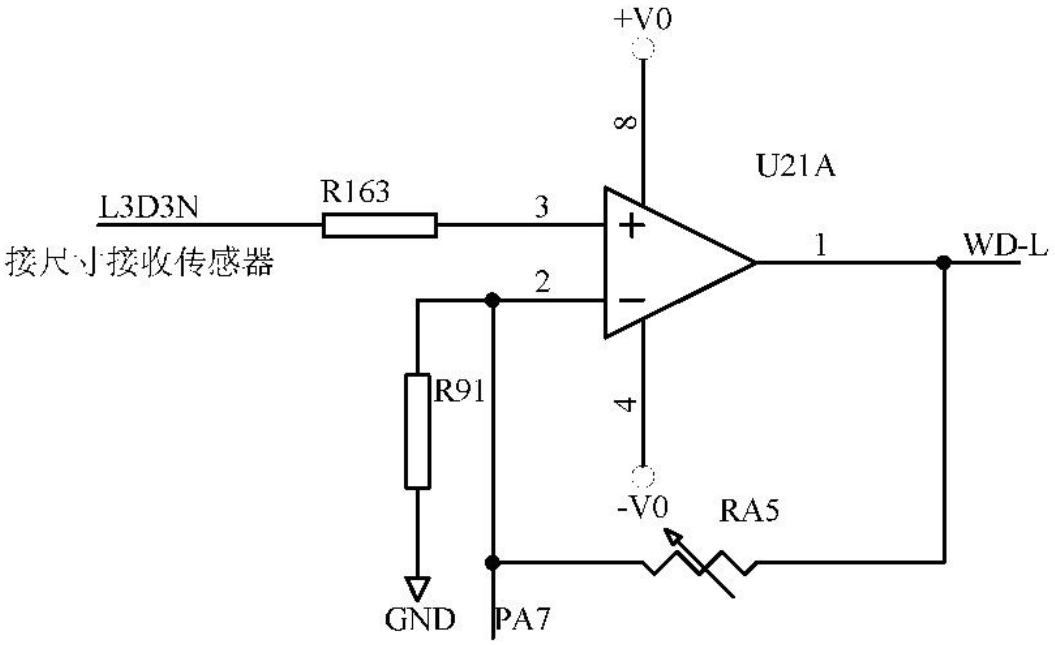
2) Electric schematic diagram and oscillogram



Emitting principle of the dimension detection



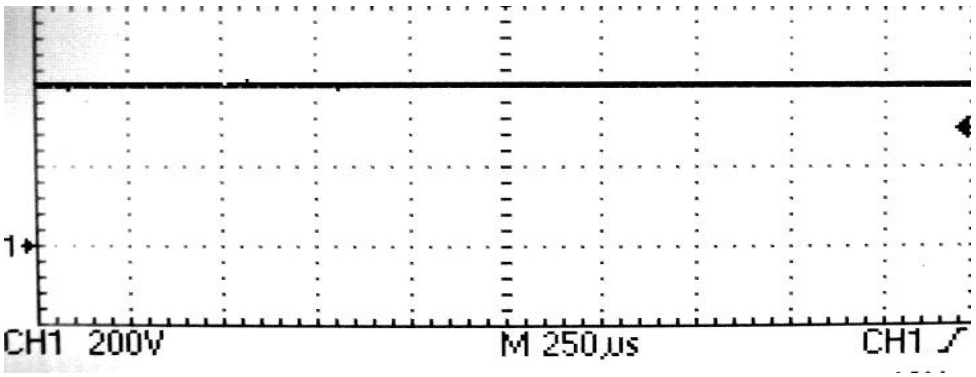
Principle of the dimension detection



Signal process principle of the dimension detection

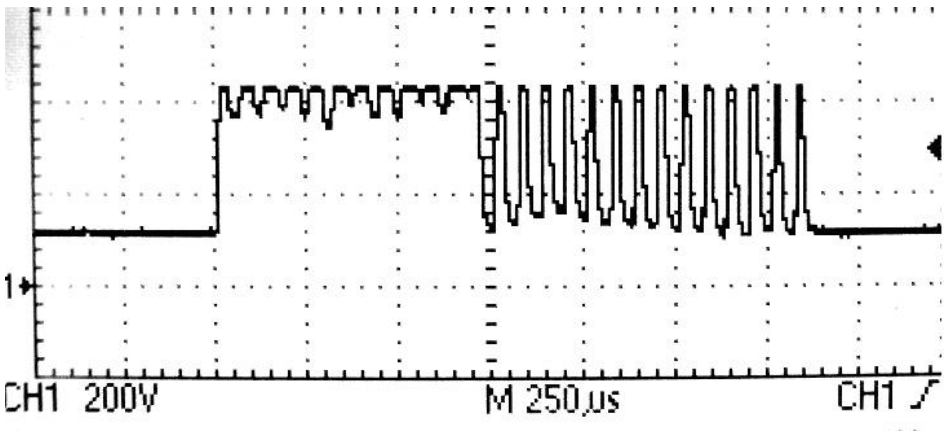
Figure 28 Schematic diagram of the dimension detection part

WD-L



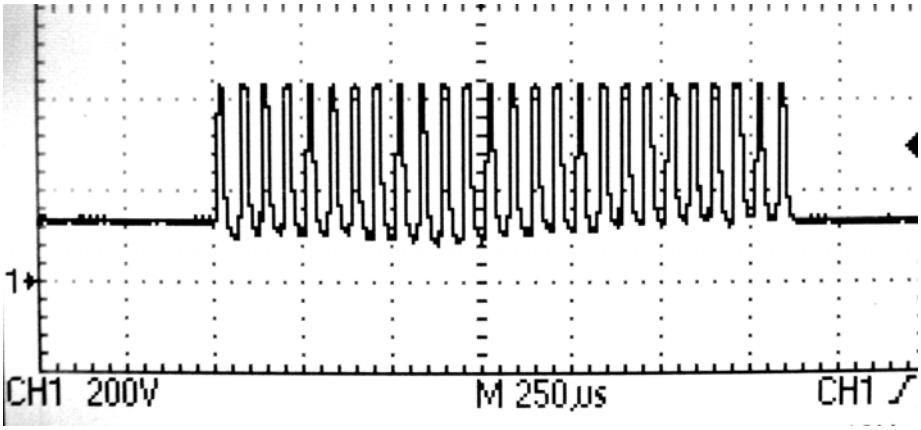
Waveform when no paper covers the sensor

WD-L



Waveform when uses a bank note partially cover the dimension sensor

WD-L



Waveform when uses a bank note fully cover the dimension sensor

Figure 29 Waveform of dimension detection

3) Installation requirements

a) Enter the display interface for dimension sensor according to requirement of 4.4 c.

b) Decrease sensitivity of dimension sensor and achieve the value of 80 also when the sensor is not covered with any bank note.

c) Move the emitting or receiving part of the dimension sensor and select a position of average and larger value for final installation.

d) Repeat the adjustment for few times until the above requirements are met.

4) Debugging

1. The first kind of debugging month (only for usage of the circuit boards of dsPIC30F4011_E, dsPIC30F4011_G and dsPIC30F6010_B1)

A. Debugging instruction

Adjusting the RA7 potentiometer can change sensitivity of the left dimension sensor; clockwise to decrease and anti-clockwise to increase.

Adjusting the RA8 potentiometer can change sensitivity of the right dimension sensor; clockwise to decrease and anti-clockwise to increase.

B. Debugging steps

a) First remove any bank note in the path and make sure there's no bank note on the path.

b) Enter the debugging interface of the dimension sensor according to description of 4.4.c.

M	**D**	**S**	J		**R**
X0	X1	X2	X3	X4	X5
Y0	Y1	Y2	Y3	Y4	Y5

Data of Row 1 shows parameters of the left dimension sensor; data of Row 2 shows the right dimension sensor; among them; X0=A3 and Y0=B3 is the mark bit.

X1, Y1 is the saturated magnitude of voltage of the sensor

X2, Y2, the maximum unsaturated and voltage difference of the sensor

X3, Y3, number of the unsaturated points of the sensor

X4, Y4, number of bad points of the sensor

X5, Y5, has empty value and temporally not being used

c) According to the sequence from left to right, one by one, adjust the data; first adjust the X1 parameter; after meeting the parameter requirement; this must be done: in the situation that the X1 parameter has met the requirement, adjust the X2 parameter; following this example and adjust the other parameters. Here are requirements for all the parameters:

(X1,Y1)>B0---------otherwise adjust the potentiometer in anti-clockwise direction

05<(X2,Y2)<30-----clockwise to decrease and anti-clockwise to increase

0F<(X3,Y3)<1F----clockwise to decrease and anti-clockwise to increase

(X4,Y4)<03 --------after meeting requirements for all the above parameters, if the requirement of this item cannot be met, replace the sensor.

After full adjustment, keep pressing the 1 key and select the R option and then press START/RESET key to exit.

2. The second kind of debugging method (universally for use by the L04-1.40D, L04-1.40E and L04-1.15B motherboards)

A. Debugging instruction

Adjusting the RA4 potentiometer can change sensitivity of the left dimension sensor; clockwise to decrease and anti-clockwise to increase.

B. Debugging steps

a) Enter the debugging interface of the dimension sensor according to instruction at 4.4.c.

b) Perform fine adjustment of RA4 and make the AD1-AD24 and BD1-BD24 values on the A and B pages into a value higher than 70; besides, values of the saturated points for the A and B pages should be 93 and 94 and there are total 1 to 5 for these.

Remark: the debugging method for the other side of the dimension sensor is the same.

7.9 Power Supply Parameters

1) Input voltage of transformer 220V±10%/50HZ or 110V±10%/60HZ.

2) Output voltage of transformer 9V,9.5V,21V,25V.

3) Voltage sent out from the power panel to the control panel 5V±5% (digital power supply), ±5V±5% (analog power supply).

4) Working voltage for the UV light of the power panel 6V±10%; high frequency output 800V, 50KHZ.

5) Voltage for running of the small motor 9V (LD60E1B,98004G power panel) or 6V (POWER0404-E power panel)

6) Voltage for running of the main motor 10V~20V (speed adjustment).

Inspection, test and fault finding for general failures

8.1 General failures of sensors

1) Failure of 16, the bill feeding sensor

Phenomenon: start the machine and it displays FE1 (CHECK HOPPER SERSOR) or automatically starts when there's no bank note on the machine.

Method of fault finding: Step 1: check if 43, the bill feeding platform (on 16, the bill feeding sensor) is covered by any object.

Step 2: check if light of the working environment is too strong.

Step 3: start the machine and check if FE1 displays; or if the matching starts automatically when there's no bank note on it and if it can't start when there's bank note; adjust RA1 in clockwise direction.

Step 4: check if the welding line on 16, the bill feeding sensor is in an open circuit.

Step 5: it should be failure of parts at 16, the bill feeding sensor.

2) Failure of the left and right counting sensor

Phenomenon: start the machine and it displays CHECK LOWER LEFT IR, CHECK LOWER RIGHT IR; or it appears abnormally during bill counting process.

Method of fault finding: Step 1: check if any bank note or paper is covering surface of 11, the left and right counting sensor.

Step 2: check if connection of the emitting lines of the left and right counting parts, the receiving lines for the left and right counting and the control panel is loosen or has bad contact.

Step 3: after starting the machine, check the voltage between Pin 1 (red wire) and Pin 3 (white wire) of JP12, which should be about 1.2V; if there's an obvious gap for the voltage, check if the receiving lines for the left and right counting is in an open circuit (stop at the welding point); if this is normal then it should be a failure of certain part of the receiving tube.

Step 5: use standard coated art paper to cover the left and right counting tubes, and then measure the voltage between Pin 1 and Pin 3 of JP14, which should be smaller than 1.5V; if there's no change in the voltage compared to the status before the covering, check if there's any short circuit at welding points of the receiving tube; if this is normal, then it should be a failure in a certain part of the receiving tube.

3) Failure of 28, the speed sensor

Phenomenon: start the machine and it displays CHECK SPEED SENSOR.

Method of fault finding: Step 1: check if connection of the wire of 10, the bill feeding speed sensor and control panel, tachometer circuit board (SPEED-C) is loosen or has bad contact.

Step 2: check if the installation position of 10, the bill feeding speed sensor (SPEED-C) is correct; it's required that teeth of the tachometer disc should face right opposite the sensor and can fully cover the light axis (see the attached figure).

Step 3: check if running of the main motor is normal.

Step 4: check corresponding circuits on the control panel.

4) Failure of 10, the bill receiving sensor

Phenomenon: start the machine and it displays CHECK STACKER SENSOR.

Method of fault finding: Step 1: check if any bank note or paper is covering 10, the bill receiving sensor.

Step 2: check if the connection between the lead of 10, the tachometer bill receiving sensor and the control panel is loosen or has any bad contact.

Step 3: check that the voltage of Pin 1 of JP6 should be larger than 4.5V, Pin 2 should be 5V (voltage of power supply), Pin 3 should be about 1.2 and Pin 4 should be 0V (earth). If the Pin 3 voltage is abnormal, the emitting tube for bill feeding should be broken; if the voltage of Pin 1 is abnormal, there should be something wrong in the emitting tube or corresponding circuits on the control panel.

Step 4: check corresponding circuits on the control panel.

5) Failure of the fluorescence sensor

Phenomenon: start the machine and it displays CHECK UV SENSOR; or it frequently displays: Suspect UV Check again.

Method of fault finding: Step 1: check if the UV sensor is covered by any plain paper.

Step 2: adjust the RA6 potentiometer in clockwise direction.

Step 3: check if there's any problem with the corresponding circuits on the control panel.

6) Failure of the dimension sensor

Phenomenon: in progress of bill counting, it frequently displays: Suspect Length Check again or Suspect Width Check again.

Method of fault finding: Step 1: check the emitting lead of the length sensor; receiving lead of the length sensor and control panel; check connection and plugging of the length detecting (emitting and receiving) circuit board.

Step 2: press the 1 key and enter detection status for length detection; the value should read above 70 when there's no plain paper cover the sensor and 20~40 when there is.

Step 3: check as Step 2 describes; if certain value reads very small, certain part of the length sensor must have failure.

Step 4: if, when there's no plain paper covering the sensor, all groups of values are the same; and, the values are still the same when there's plain paper covering, or no change of the values, check the emitting lead of the length sensor; check if there's any problem with the receiving lead of the length sensor and welding of the length detecting circuit board.

Step 5: check corresponding circuits on the control panel.

7) Failure of the safety line sensor

Phenomenon: in progress of bill counting, it frequently displays: Suspect MT Check again.

Method of fault finding: Step 1: check if connection of lead of the big magnetic head and the control panel is loosen or has bad contact.

Step 2: unplug and take off wire of the big magnetic head; check that the voltages of Pin 1 and 4 of JP25 of the control panel should be respectively about 2.5V and their earth wire and signal line there should be about -2.5V; if this is abnormal, check corresponding circuits on the control panel.

Step 3: plug wire of the big magnetic head into JP25 on the control panel; check that the Pin 1~4 voltages should be respectively about 2.5V at JP25 and the earth wire and signal line about -2.5V; if this is abnormal, the big magnetic had has problem.

Step 4: adjust the RA11 potentiometer on the control panel.

8) Failure of the magnetic ink sensor

Phenomenon: in progress of bill counting, Suspect MG Check again frequently appears.

Method of fault finding: Step 1: check if connection of the lead of the small magnetic head and the control panel is loosen or has bad contact.

Step 2: unplug wire of the small magnetic head from the control panel, and then check if the voltages of Pin 1 and 8 at JP24 on the control panel are respectively about -2.5V and +2.5V, and their signal lines and earth wires about -2.5V and +2.5V; if they're abnormal, check corresponding circuits on the control panel.

Step 3: plug wire of the small magnetic head into JP24 on the control panel, and then check if the voltages of Pin 1 and 4 at JP24 on the control panel are respectively about -2.5V and +2.5V, and their signal wires and earth wires -2.5V; if they're abnormal, check corresponding circuits on the control panel; if the circuits are abnormal, it should be a problem of the small manager head.

9) Failure of the left and right position sensors.

Phenomenon: start the machine and it displays Left count sensor error.

Method of fault finding: Step 1: check if connections of the double barreled emitting lead, double barreled receiving lead and the control panel are loosen or have bad contact.

Step 2: check if positive voltage of the emitting tube is about 1.2V; if the voltage is too much different, it should be a problem of the emitting tube.

Step 3: check the voltages of Pin 1 and 3 at JP7; when the sensor is covered with plain paper, adjust the RA9 and RA10 potentiometers until the voltages of Pin 1 and 3 become 0.5V; and then take out the plain paper and check if the voltage of Pin 3 is larger than 3V; if lower then 3V, replace the emitting tube or receiving tube.

Step 4: check if Pin 1 and 4 at JP7 are electrically connected with Pin 4 of the single chip.

8.2 Bill feeding motor doesn't work

Please check output signal of the control panel and Pin 3 of JP3 of the motherboard. When the motor is working, it should be in low level (>0.6V); when it is not working, it should be in high level (>3.6V). Check the power supply status. Disassemble the bill feeding shield and then check if wire of the small motor is properly plugged onto the 4JP4 of the power panel.

8.3 The main motor doesn't work or is hard to be started

Check control signal of the main motor and output voltage status at the Pin 5 socket of JP3 on the motherboard. When the motor is working, it should be square wave. When the motor is not working, it should be high level (>3.6V). Check if the

two 9014s and TIP122s on the power panel have become ineffective. Check input and output status of RIF640.

8.4 Machine working but display abnormally

If there's interrupted display or darkened image, check if J6 (or J3J4) is well plugged or has bad contact.

If pressing of any key is ineffective, check if J5 on the display panel is well plugged; for 2 x 4 pin plug, you should plug from Pin 1.

8.5 No response after being started

Turn off the machine immediately and check input and output requirement for the power supply section.

8.6The other failures

1) Shutoff protection

Turn off the power, more the machine to a place where is free of any disturbance, restart the machine.

2) Communication error

Step 1: restart the machine

Step 2: check if the connection wire is loosen or has bad contact

Step 3: check if version name of the software meets requirement of the factory setting

Maintenance and routine inspection

9.1 Weekly maintenance task

Remove dust; clean dirt and ink spill.

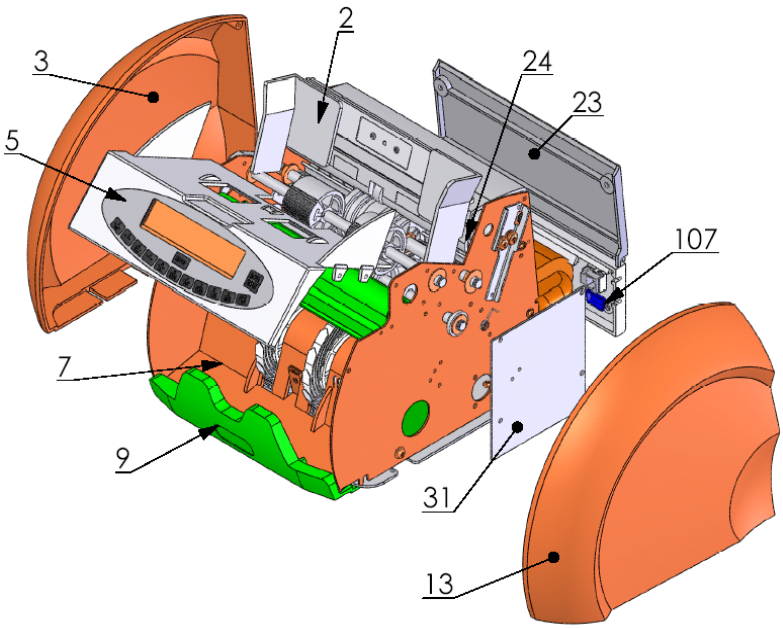
9.2 Semiannual maintenance task

Check worn condition of the machine

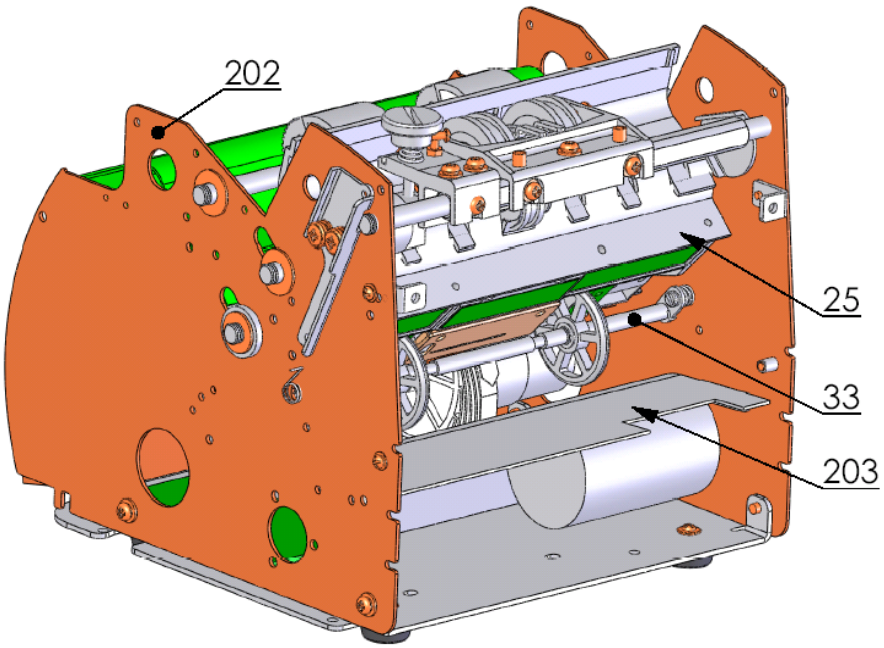
Check connection status of all plugs

Appendix 1 Structure and assembly relationship of the mechanical part

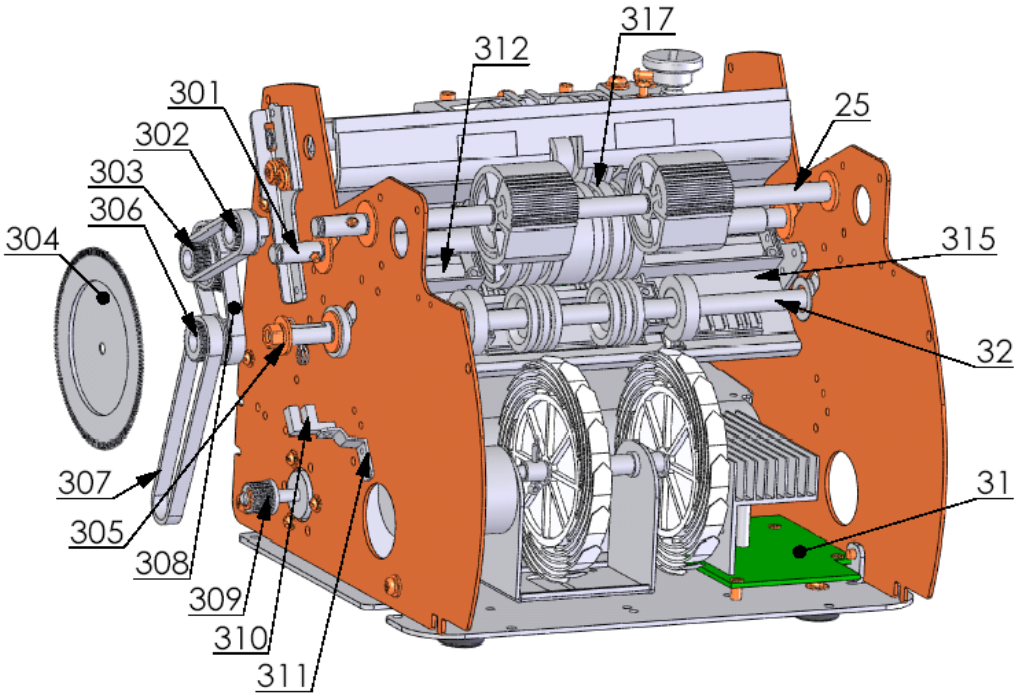
Appendix 1.1 Relation Schema for assembly of structural components



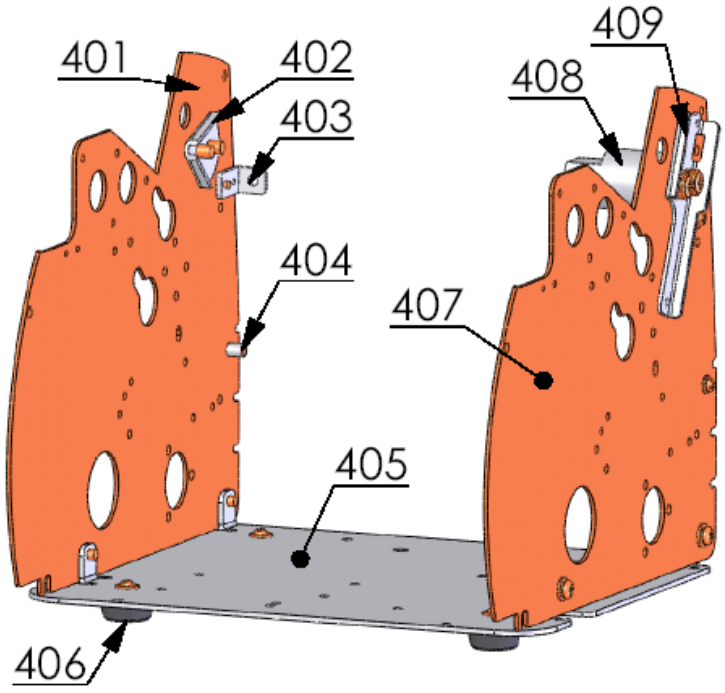
Attached figure J1 Relation Schema for assembly of the machine



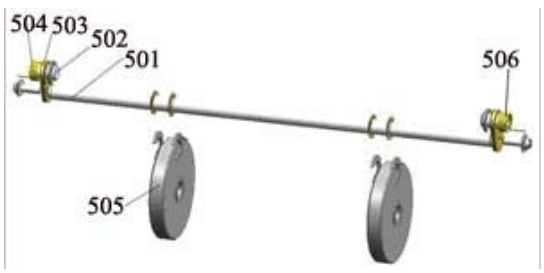
Relation Schema for assembly of the machine J2



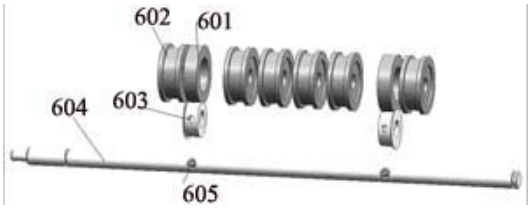
Relation Schema for assembly of the machine J3



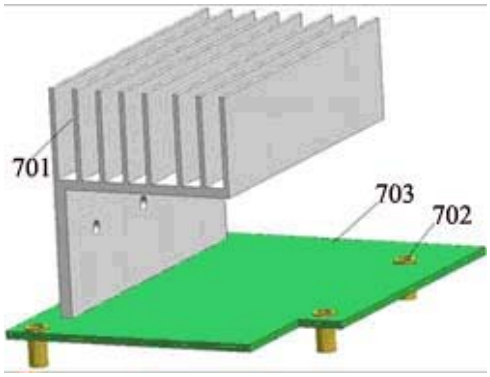
Attached figure J4 relationship for assembly of the machine



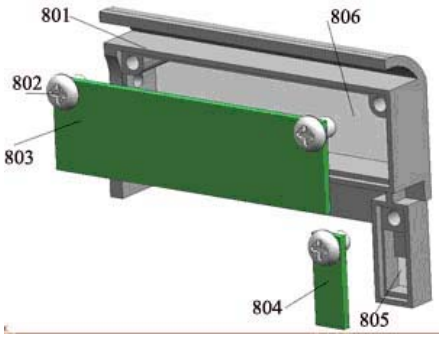
Attached figure J5 assembly relationship for rotation wheels



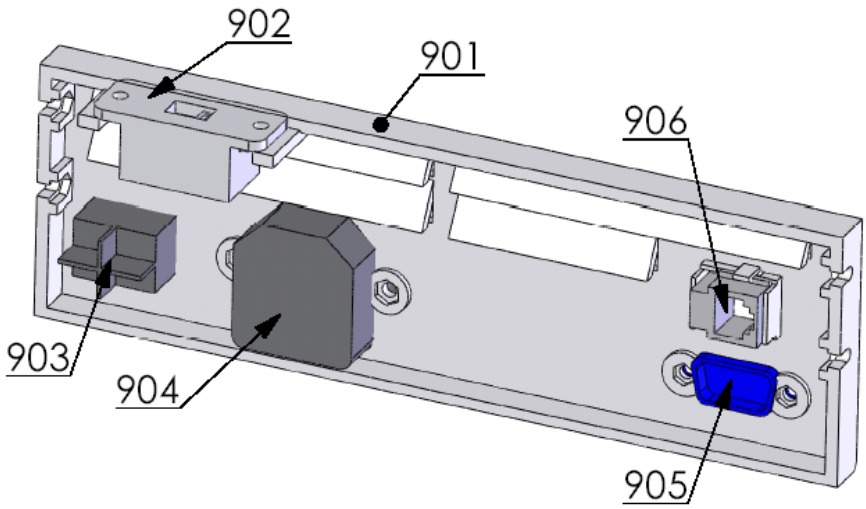
Attached figure J6 assembly relationship for the lower conveyance wheels



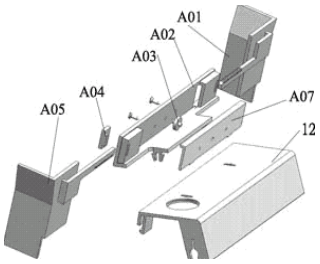
Attached figure J7 assembly relationship for the power panel



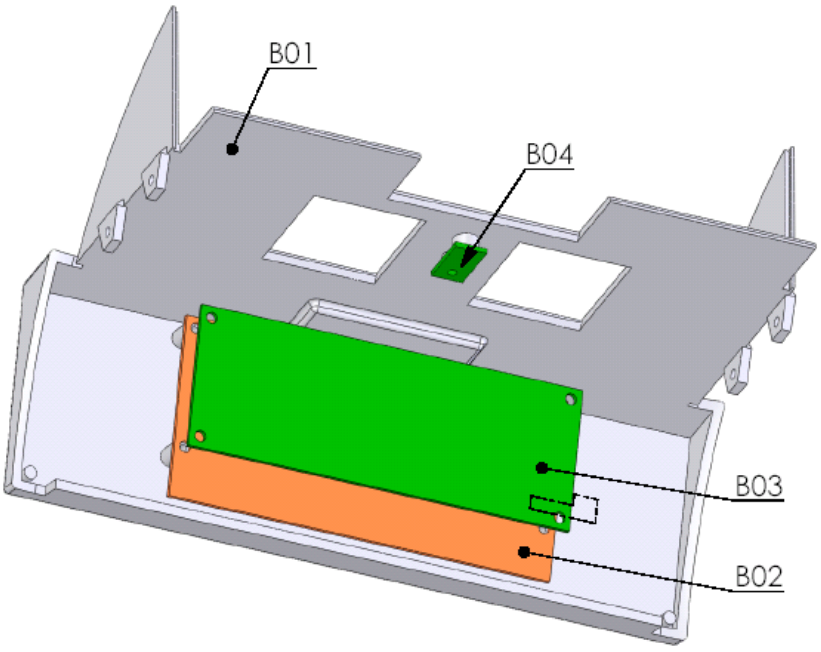
Attached figure J8 assembly relationship for the upper conveyance board



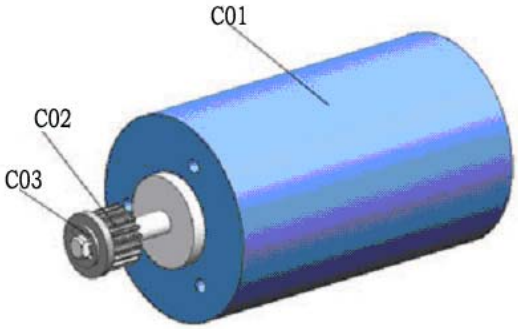
Attached figure J9 assembly relationship for the lower rear cover board



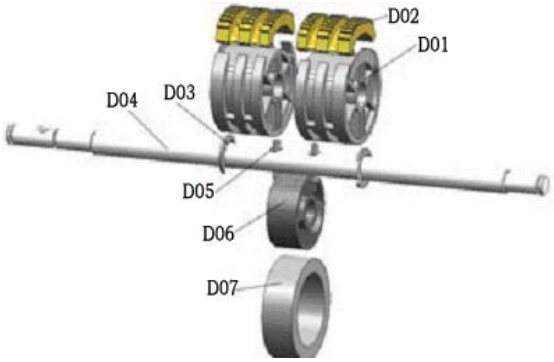
Attached figure J10 assembly relationship for the bill **linkage baffle**



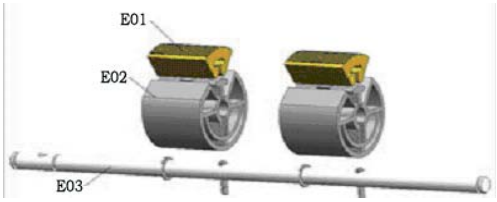
Attached figure J11 assembly relationship of bed plate



Attached figure J12. Assembly relationship of the big motor

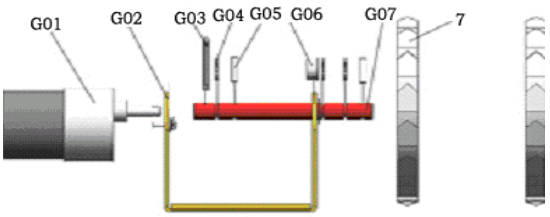


Attached figure J13 Assembly relationship of the friction wheels

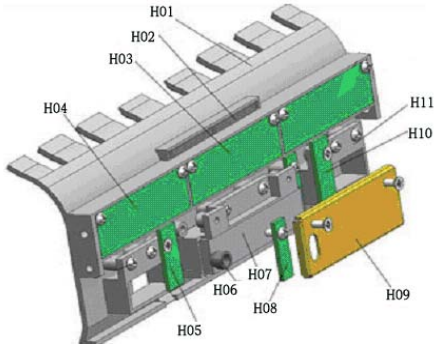


Attached figure J14. Assembly relationship of the bill feeding wheels

Attached figure J15 Assembly relationship of the separating mechanism



Attached figure J16 Assembly relationship of the bill feeding wheel



Attached figure J17 Assembly relationship of the lower conveyance baffle

Appendix 1.2 Part list for Relation Schema of assembly for the structural components

No.	Name of Part	Quantity	Remark
5	Bed plate component	1	
3	Left shield	1	
6	Shield component of bill receiving wheel	1	
9	Bill receiving baffle	1	
34	Component of control panel	1	
11	Right shield	1	
107	Component of rear lower cover board	1	
20	Rear upper cover board	1	
21	Separating structure	1	
2	Component of bill linkage baffle	1	
1	Handle component	1	
30	Bracket component	1	
203	Guard board	1	
33	Component of rotating wheel	1	
25	Component of the lower conveyance baffle	1	
301	Cylindrical pinφ3x12	1	
302	Small belt wheel (synchronous belt 52MXL025)	1(1)	
303	Leakage synchronous belt wheel	1	
304	Tachometer disc	1	
305	Plain cushionφ5x12	1	
306	Small dual synchronous belt wheel	1	
307	synchronous belt 80MXL025	1	
308	synchronous belt 53MXL019	1	

309	Motor component	1	
310	Component of tachometer sensor	1	
311	Sensor bracket	1	
312	Component of left upper conveyance baffle	1	
31	Component of power panel	1	
32	Component of lower conveyance wheel	1	
315	Component of right upper conveyance baffle	1	
316	Feeding wheel component	1	
317	Friction wheel component	1	
401	Left side board	1	
402	Left torsional spring ordination axis	1	
403	Fixing bracket of rear upper cover boards	2	
404	Spacing pins	2	
405	Bottom board	1	
406	Pins	4	
407	Right side board	1	
408	Supporting block	1	
501	Rotating wheel axis	1	
502	Fixed axises of pinch wheel bracket	2	
503	Pinch wheel brackets	2	
504	Left torsional spring of pinch wheel	1	
505	Rotating wheels	2	
506	Right torsional spring of pinch wheel	1	
601	Rubber rings of lower conveyance wheel	2	
602	Pinch rims of magnetic head	6	
603	Wheel bases of lower conveyance wheel	2	
604	Axix of lower conveyance wheel	1	
605	Flexible cylindrical pinφ3x12	2	
701	Heat elimination block	1	
702	Pressing sleeve	3	
703	Circuit board	1	
801	Left upper conveyance baffle	1	
802	Pan head screws with cross recess M3x5	3	
803	Part of emitting circuit board of upper conveyance baffle	1	
804	Part of counting circuit board of upper conveyance baffle	1	

805	Dust proof glass of illumination	1	
806	Dust proof glass	1	
901	Rear lower cover board	1	
902	Selector switch part	1	
903	Power switch part	1	
904	Power socket part	1	
905	External display cable	1	
A01	Left heightening board	1	
A02	Fixing board	1	
A03	Gear	1	
A04	Built-in block of fixing board	1	
A05	Right lightening board	1	
12	Upper cover board	1	
A07	Rack cover board	1	
B01	Bed plate	1	
B02	Component of display panel	1	
B03	Component of LCD control panel	1	
B04	Part of bill feeding sensor	1	
C01	Big motor	1	
C02	Small belt wheel	1	
C03	E ringφ6	1	
D01	Friction wheel bodies	2	
D02	Parts of friction blocks	2	
D03	E ringφ8	2	
D04	Friction wheel axis	1	
D05	Flexible cylindrical pinφ3x12	2	
D06	Upper conveyance wheel body	1	
D07	Big rubber ring	1	
E01	Feeding friction blocks	2	
E02	Feeding wheel bodies	2	
E03	Feeding wheel axis	1	
F01	Pinch wheel reed	1	
F02	Pinch wheel side boards	2	
F03	Bracket die cast	1	
38	Spacing rings	2	

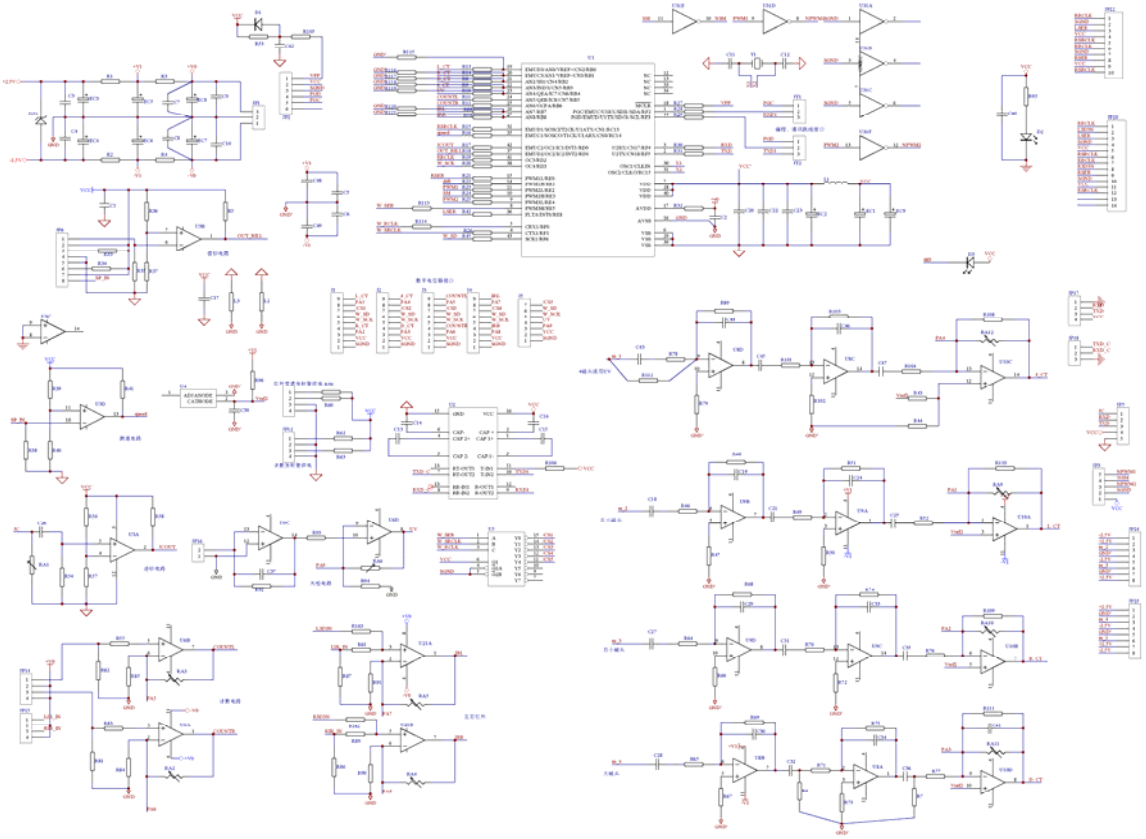
37	Bracket fixing axis	1	
F06	Bearing cap	1	
F07	Bearing F688	1	
F08	Pinch wheel	1	
F09	Auxiliary pinch wheel	1	
33	Auxiliary pinch wheel	1	
F11	Separating wheel bodies	2	
40	Upper baffle	1	
F13	Separating wheel blocks	2	
F14	Auxiliary pinch side boards	2	
35	Separating axle	1	
F16	Single-direction bearing HF0812	1	
F17	Adjusting bolt	1	
15	Adjusting knob	1	
G01	Small motor component	1	
G02	Bracket of feeding wheel	1	
G03	Cotter pinφ2.5x6	1	
G04	E ringφ6	3	
G05	Flexible Cylindrical pinφ3x12	2	
G06	Shaft liner	1	
G07	Axis of feeding wheel	1	
7	Bill feeding wheel	2	
H01	Lower conveyance baffle	1	
H02	Bar magnets	2	
H03	UV light part	1	
H04	Parts of receiving circuit board of lower conveyance baffle	2	
H05	Part of circuit board of right magnetic head	1	
H06	Cover of sensor	1	
H07	Big magnetic head	1	
H08	Counting and receiving parts	2	
H09	Cover board of the big magnetic head	1	
H10	Part of circuit board of left magnetic head	1	
H11	Left base of magnetic head	1	

Appendix 2 Structural Relation Schema of the Electrical Part (for reference only)

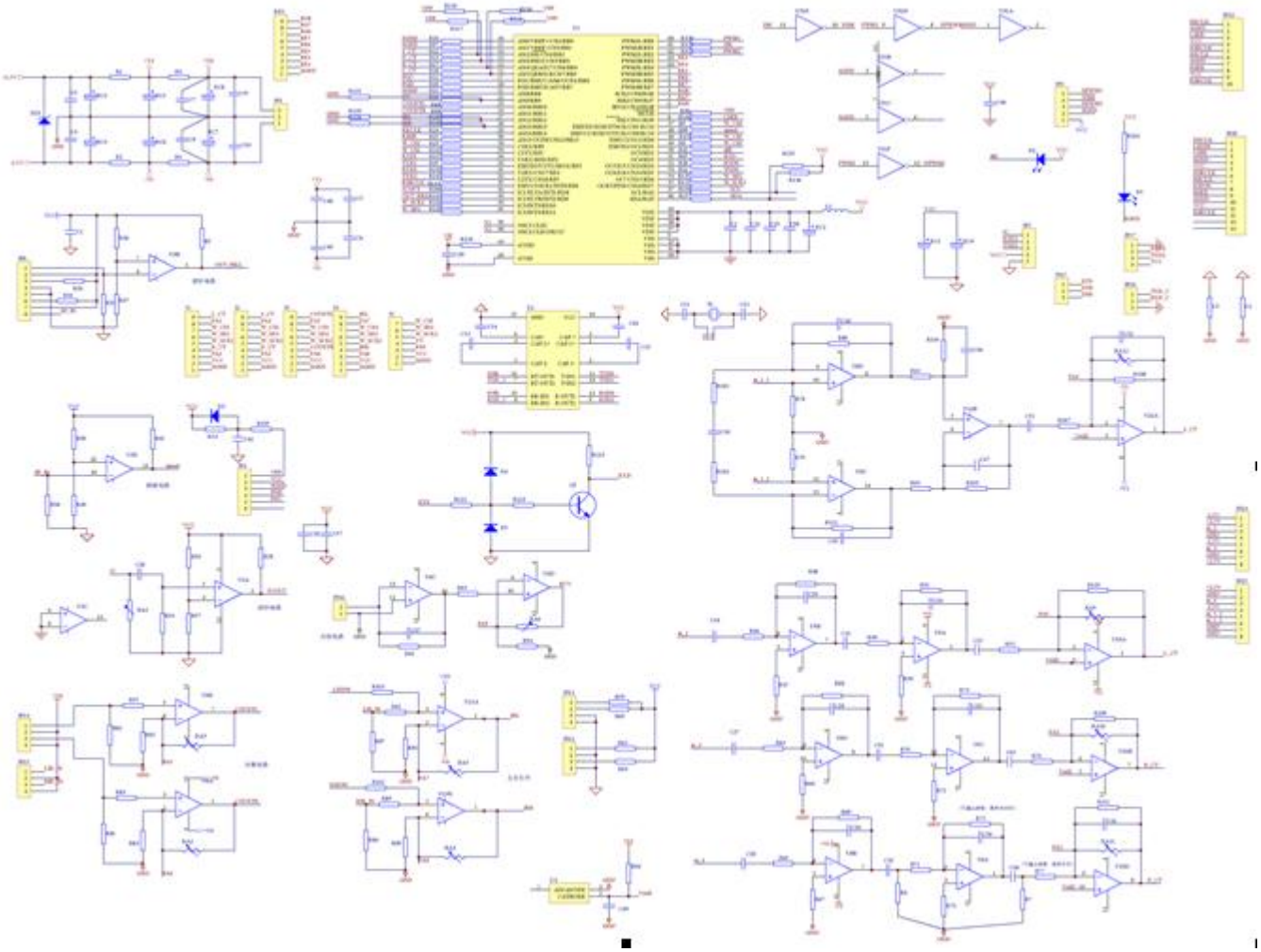
Appendix 2.1 Electric schematic

1) Schematic diagram of the control panel

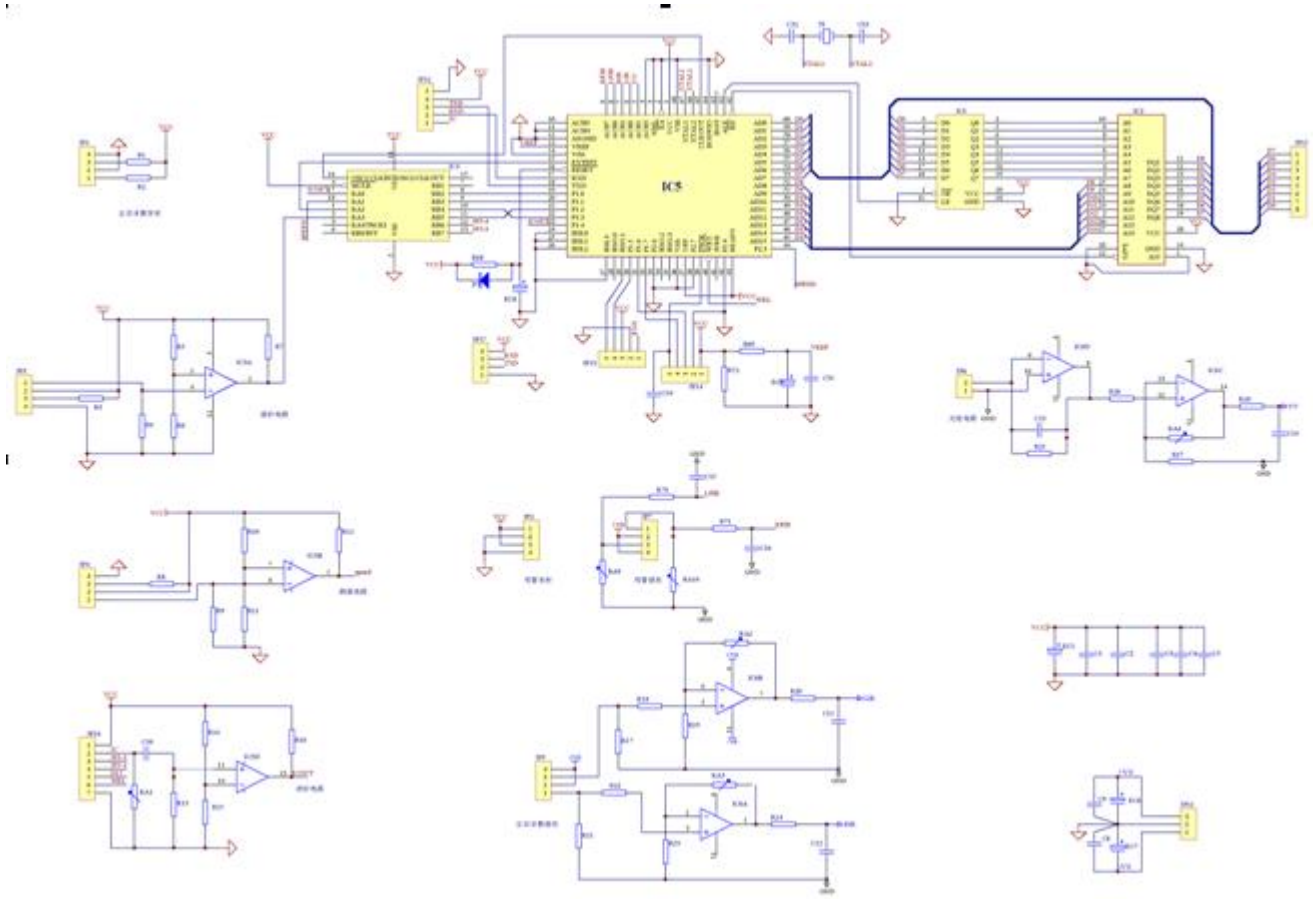
Attached figure D1 Schematic diagram of the L04-1.40E control panel



Attached figure D2 Schematic diagram of the L04-1.15B control panel

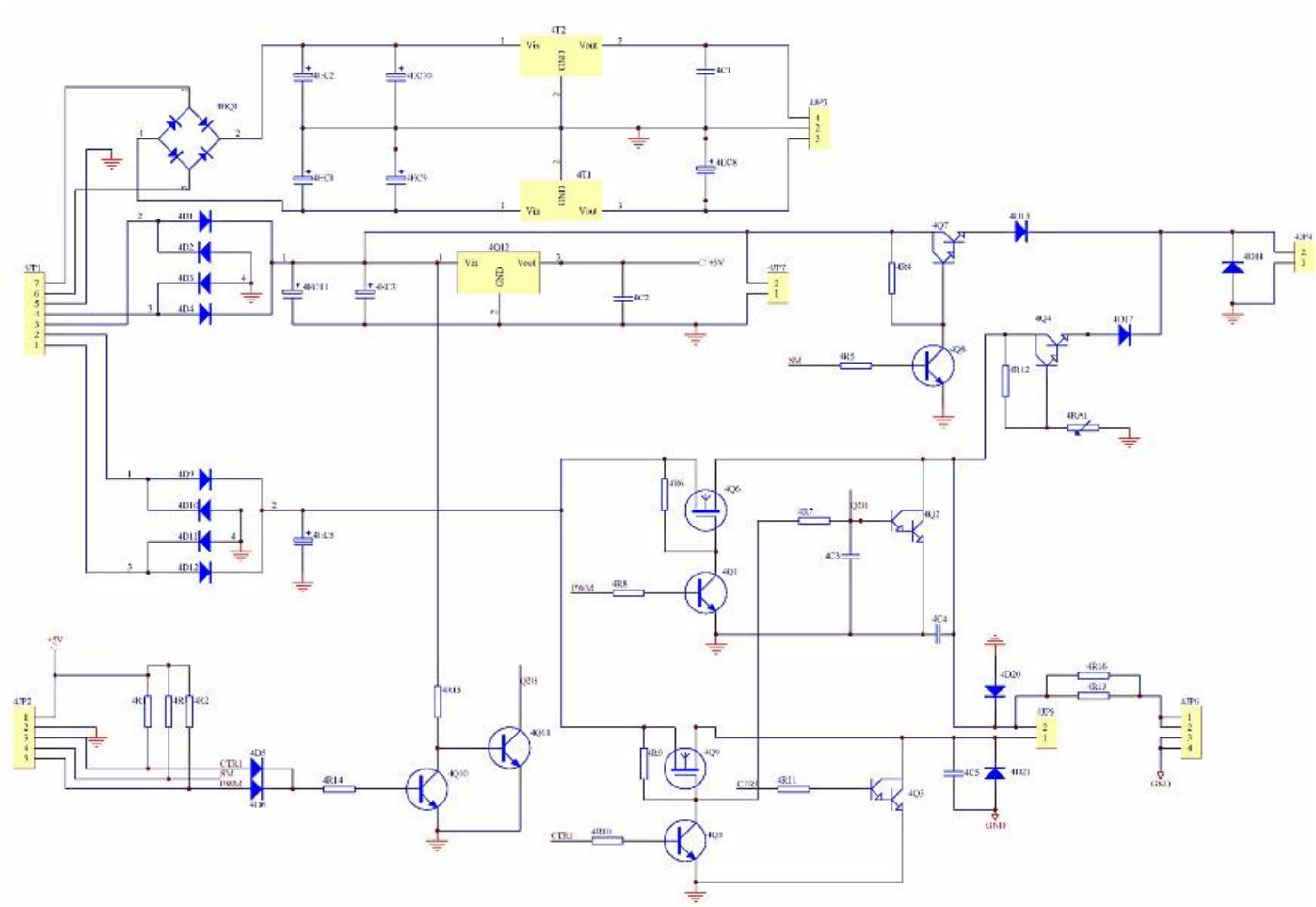


Attached figure D3 Schematic diagram of the MAIN0408-A control panel



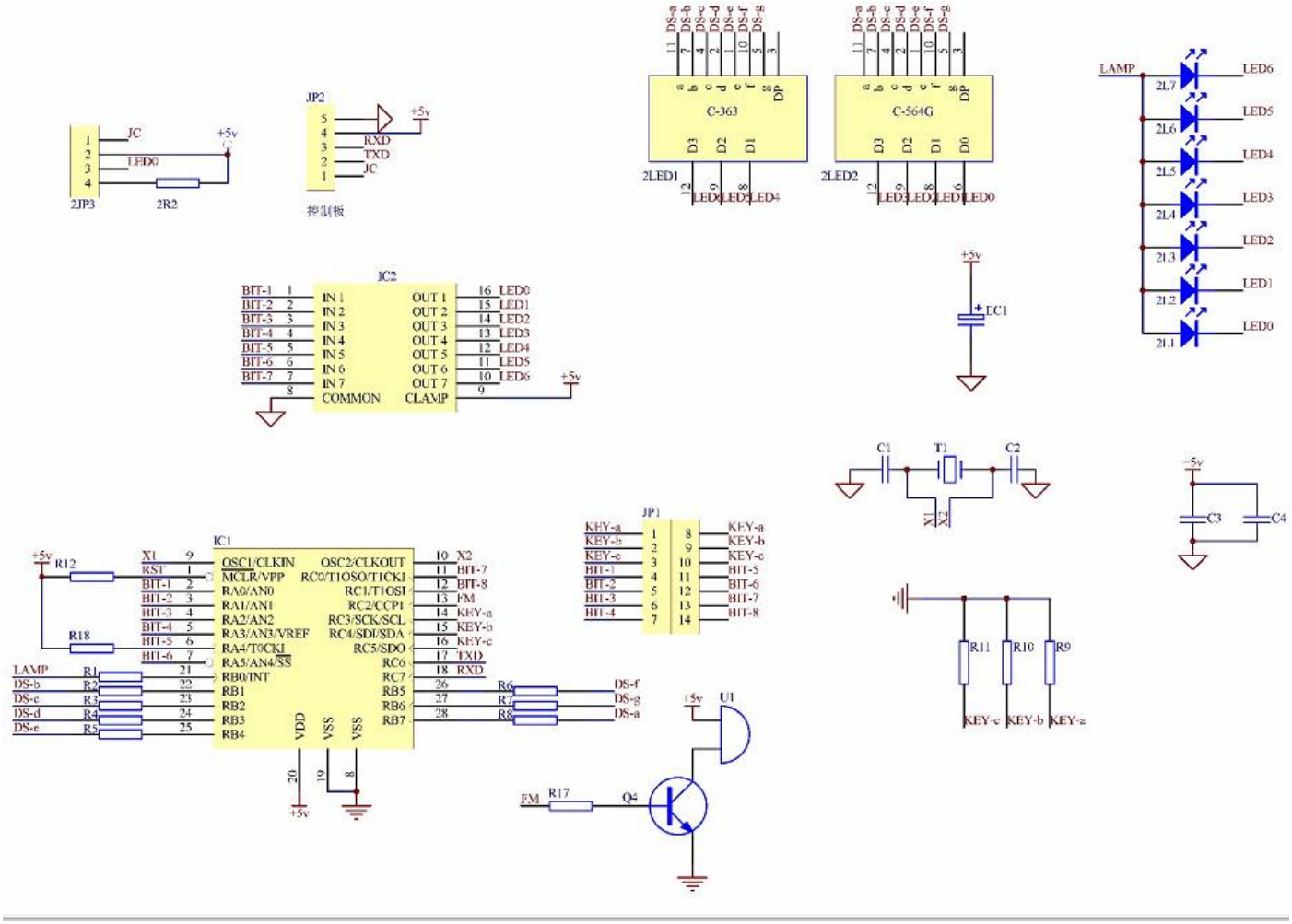
2) Schematic diagram of power panel

Attached figure D4 Schematic diagram of the POWER0404_e power panel

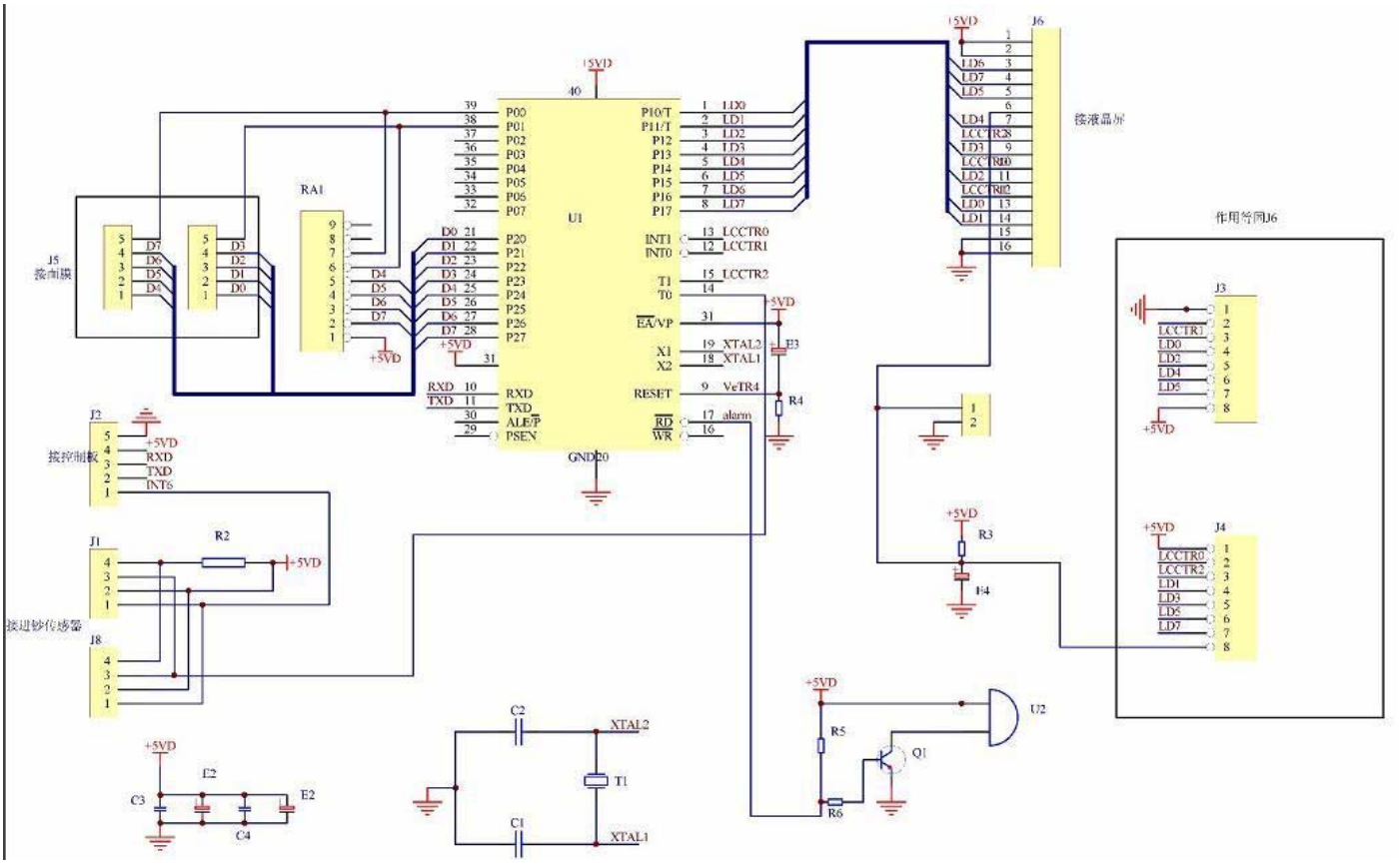


3) Schematic diagram of display panel

Attached figure D5 Schematic diagram of the dspDIS0508-A digital display panel

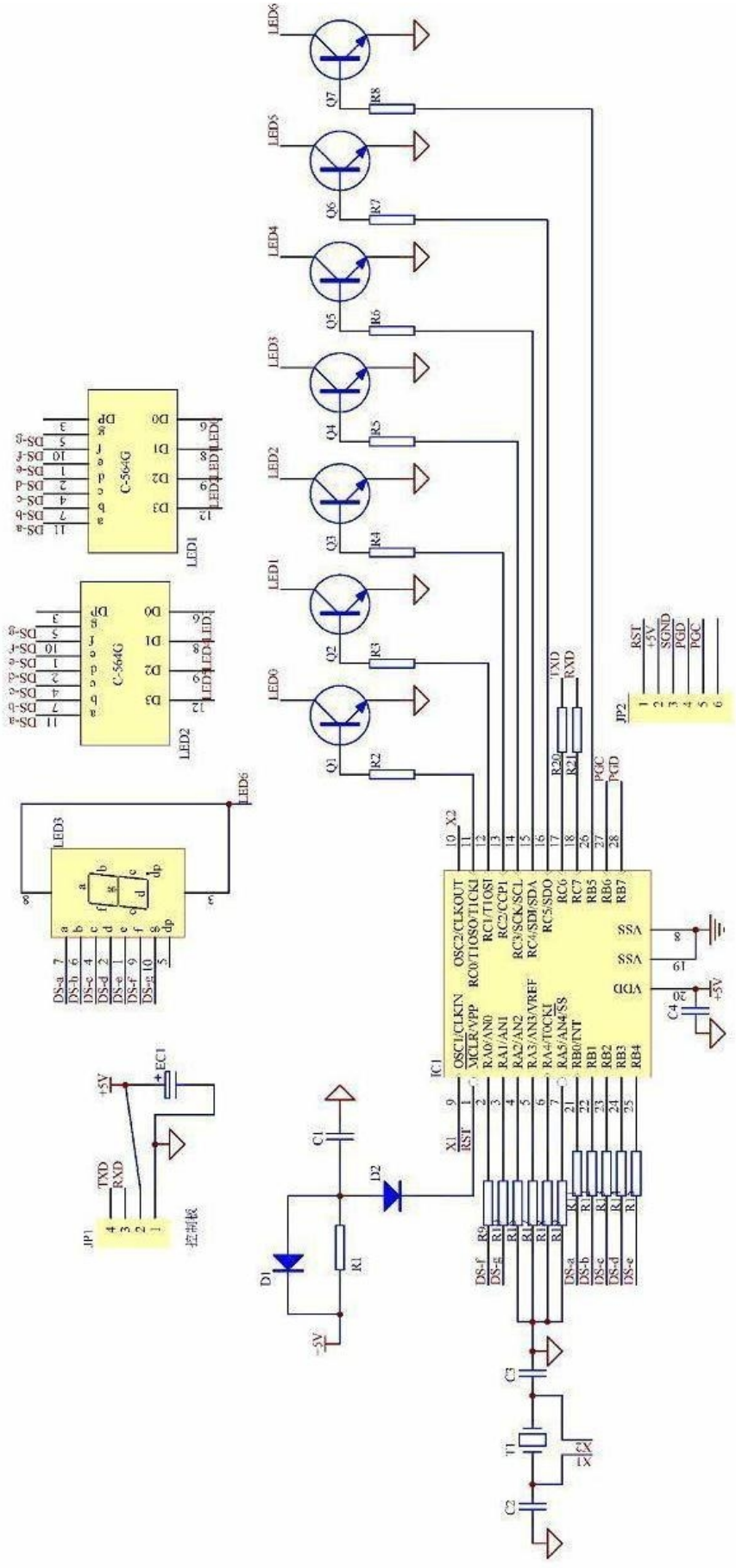


Attached figure D6 Schematic diagram of the L02-03-2.BA1 LCD display panel

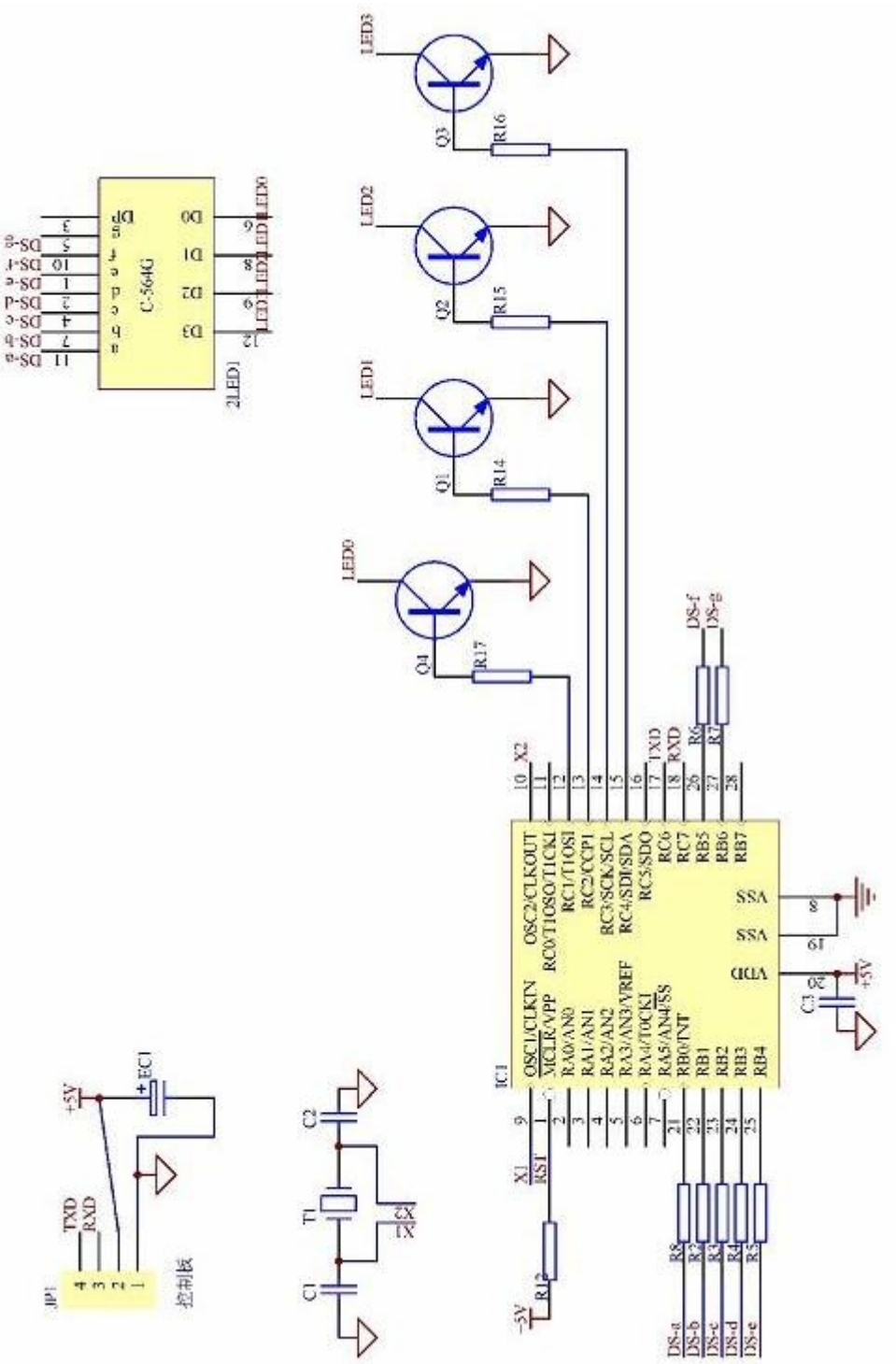


4) Schematic diagram of display panel

Attached figure D7. Schematic diagram of the L09-4 external display panel

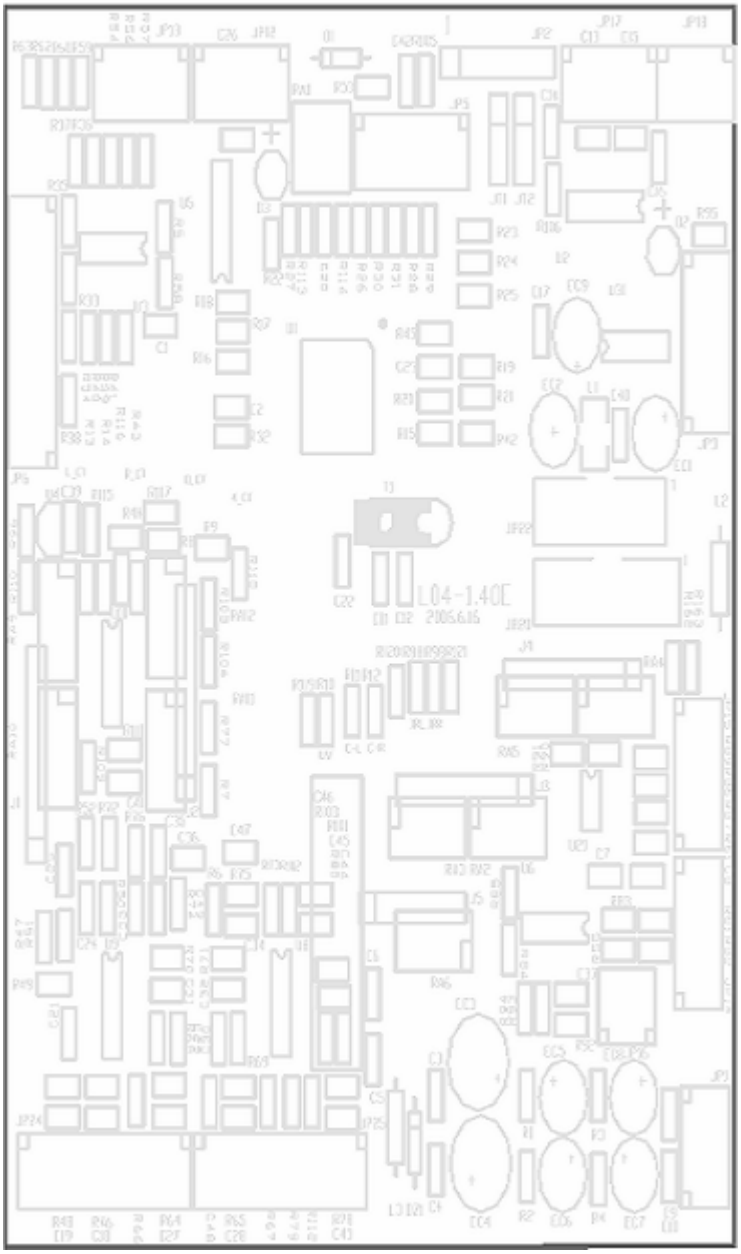

LED6
LED5
LED4
LED3
LED2
LED1
Q7
Q6
Q5
Q4
Q3
Q2
Q1
R8
R7
R6
R5
R4
R3
R2
C-564G
LED1
LED2
LED3
IC1
OSC1/CLKIN
OSC2/CLKOUT
MCLR/VPP
RA0/AN0
RA1/AN1
RA2/AN2
RA3/AN3/VREF
RA4/T0CKI
RA5/AN4/SS
RB0/INT
RB1
RB2
RB3
RB4
RC0/T1OSO/T1CKI
RC1/T1OSI
RC2/CCP1
RC3/SCK/SCL
RC4/SDI/SDA
RC5/SDO
RC6
RC7
RB5
RB6
RB7
VSS
VSS
VDD
X1
X2
RST
TXD
RXD
PGC
PGD
JP2
JP1
EC1
C1
C2
C3
C4
D1
D2
R1
T1
+5V
-5V
控制板

Attached figure D8. Schematic diagram of the XSQ02-A external display panel



Appendix 2.2 Electrical Wiring Diagram

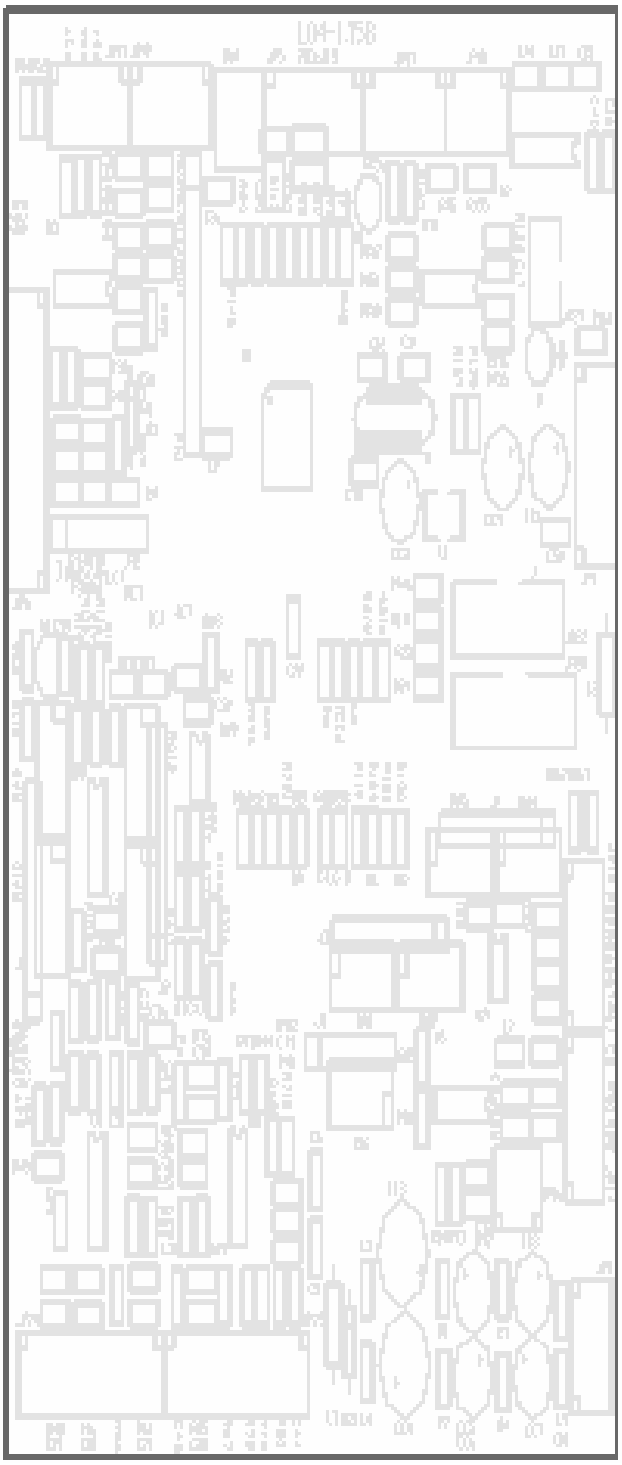
Attached figure D9 Electrical wiring diagram



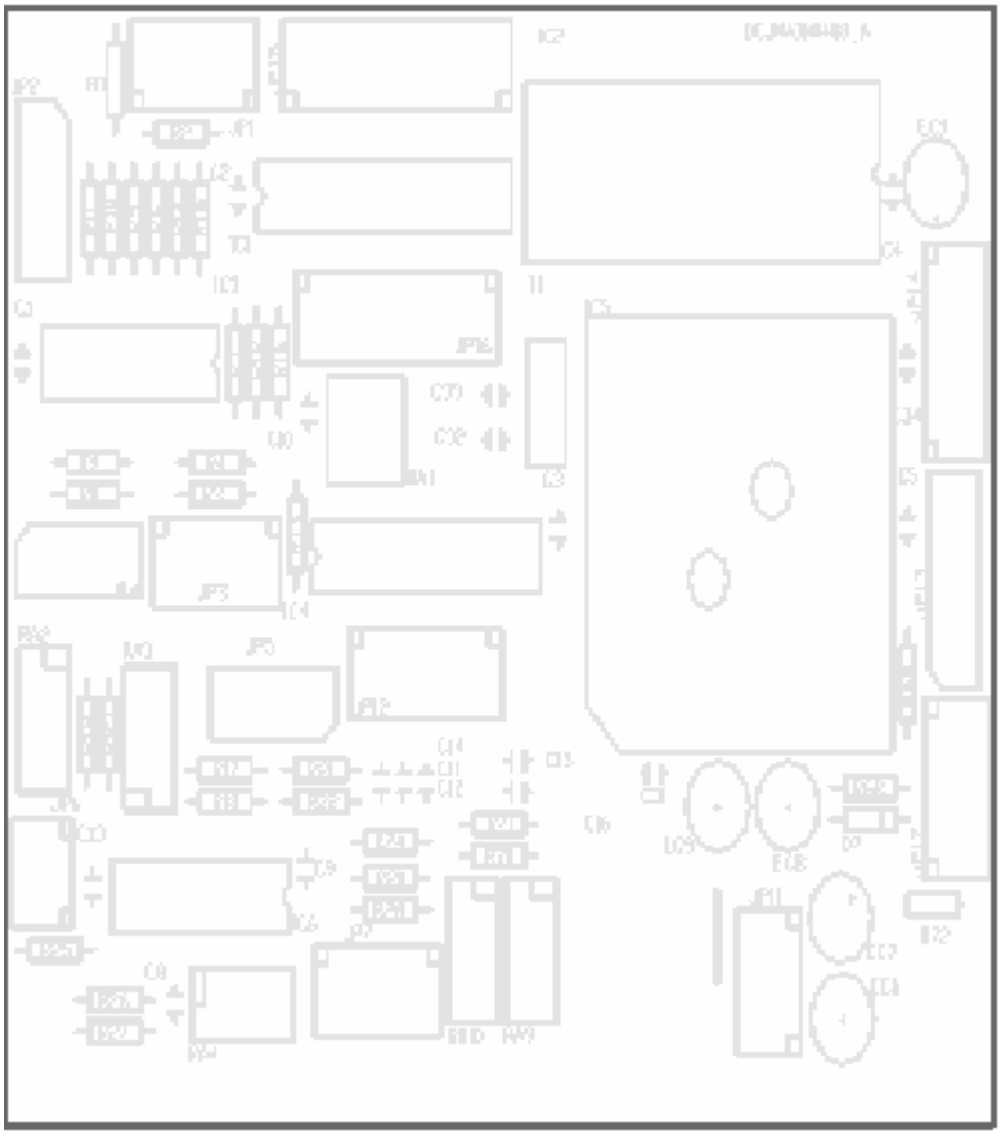
Appendix 2.3 Position Marking Diagram of Circuit Board

1) Position marking diagram of control panel

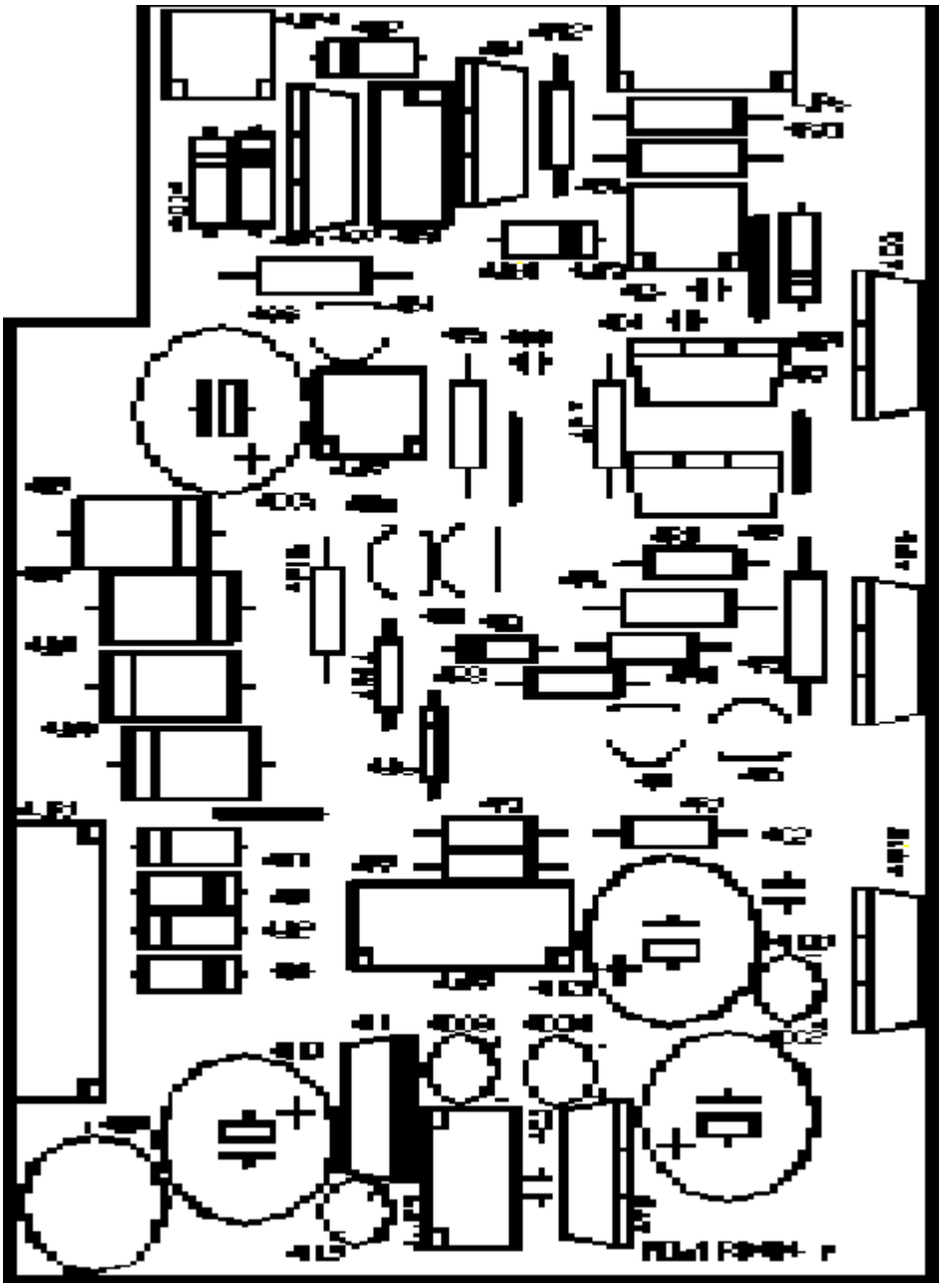
Attached figure D10 Position marking diagram of the L04-1.40E control panel



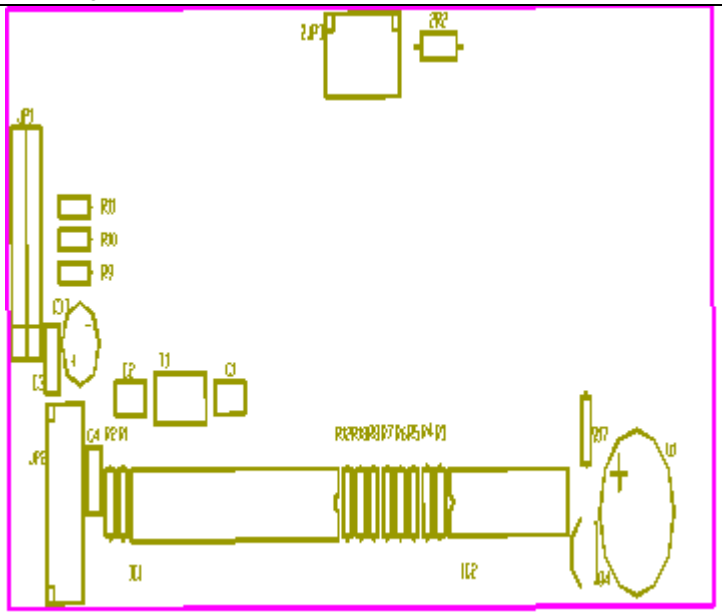
Attached figure D11 Position marking diagram of the L04-1.15B control panel



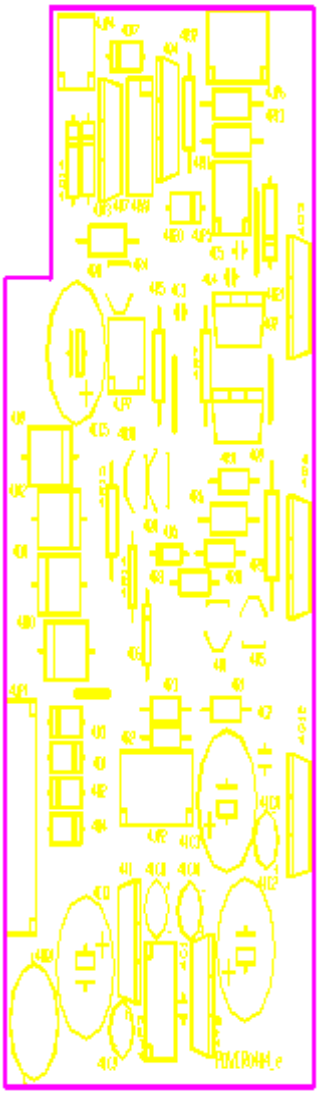
Attached figure D12 Position marking diagram of the MAIN0408-A control panel



2) Position marking diagrams of power panels

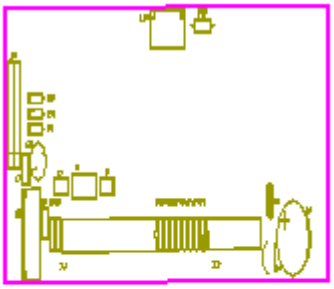


Attached figure D13 Position marking diagram of the POWER0404_e power panel

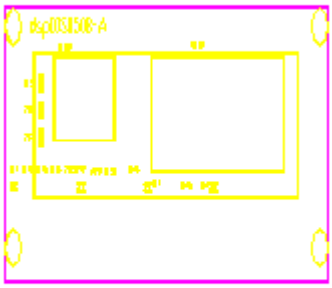


3) Position marking diagrams of display panels

Attached figure D14 Position marking diagram of the dspDIS0508-A display panel



FACE

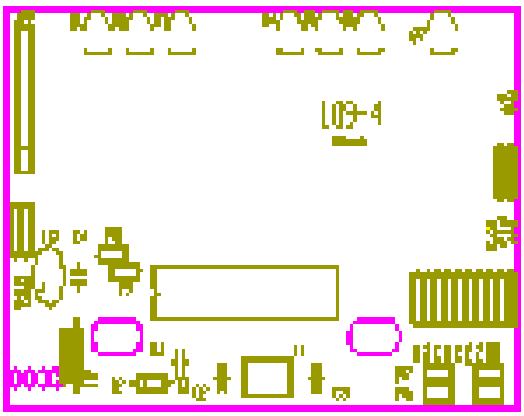


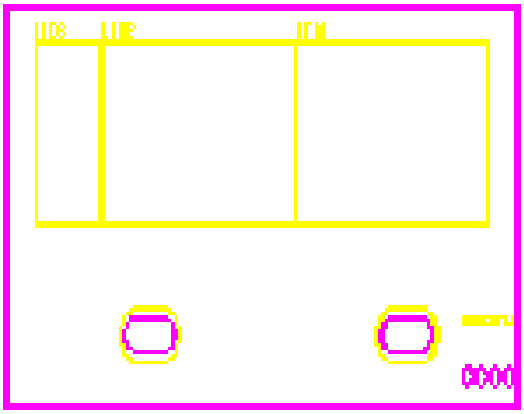
BACK

Attached figure D15 Position marking diagram of the L02-03-2.BA1 LCD display panel

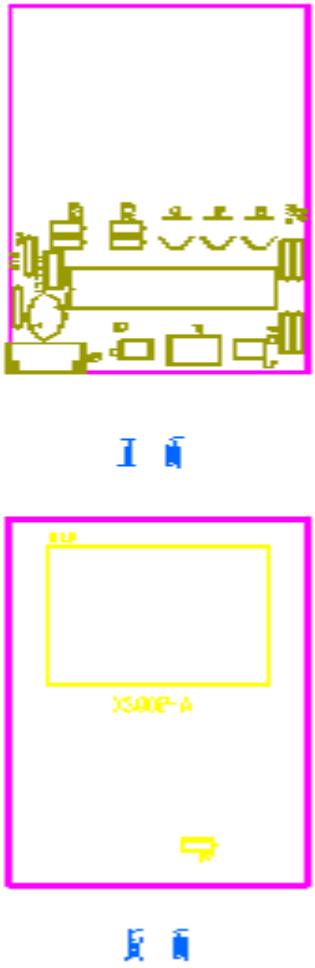
4) Position marking diagrams of display panels

Attached figure D16 Position marking diagram of the L09-4 external display panel





Attached figure D17 Position marking diagram of the XSQ02-A external display panel



Appendix 3 List of Electrical Components (for reference only)

Appendix 3.1 Component list of control panels

1) Component list of the L04-1.40E control panel

L04-1.40E			
No.	Name	Quantity	Making and Description
1	pin	2	JT1,JT2
2	pin	1	JP2
3	regulator tube	1	DZ1
4	bead	2	L2,L3
5	inductance	1	L1
6	electrolytic condenser	7	EC1,EC2,EC5,EC6,EC7,EC8,EC9
7	electrolytic condenser	2	EC3,EC4
8	potentiometer	1	RA1
9	potentiometer	6	RA2,RA3,RA4,RA5,RA6,RA11
10	potentiometer	2	RA9,RA10
11	diode	1	D1
12	LBD	2	D2,D3
13	crystal oscillator	1	T1
14	integrated block	1	U1
15	integrated block	1	U3
16	integrated block	1	U2
17	integrated block	1	U31
18	integrated block	1	U6
19	prover pipe	1	U4
20	integrated block	2	U8,U9,U10
21	integrated block	1	U21
22	prover pipe	1	U4
23	pin	5	Respectively one in the lower and upper parts of L2,D_CT(upper part of R9),L_CT,R_CT(upper part of R44)
24	cross jumper	2	JT1,JT2
25	nylon socket	1	JP16
26	nylon socket	1	JP1
27	nylon socket	3	JP12,JP14,JP25(weld from Pin 1 to Pin 4)
28	nylon socket	2	JP6,JP24
29	nylon socket	2	JP3,JP5
30	nylon socket	1	JP17和JP18(Pin 1 of JP17 suspended)
31	IDC socket	1	JP22
32	IDC socket	1	JP20
33	SMD capacitor	11	C1,C2,C3,C4,C5,C6,C7,C8,C9,C10,C39
34	SMD capacitor	15	C13,C14,C15,C16,C17,C20,C22,C23
			C25,C26,C35,C40,C42,C48,C49
35	SMD capacitor	2	C11,C12
36	SMD capacitor	1	C37
37	SMD capacitor	2	C28,C36
38	SMD capacitor	2	C30,C34
39	SMD capacitor	1	C41

40	SMD capacitor	5	C18,C21,C27,C31,C32
41	SMD capacitor	4	C19,C29,C24,C33
42	SMD resistor	11	R3,R4,R8,R10,R11,R12,R13
			R14,R32,R88,R98
43	SMD resistor	22	R1,R2,R15,R16,R17,R18,R19,R20,R21,R23,R24
44			R25,R26,R27,R28,R29,R30,R31,R42,R45,R113,R114
45	SMD resistor	2	R62,R63
46	SMD resistor	6	R33,R34,R47,R66,R79,R93
47	SMD resistor	3	R55,R57,R83,R162,R163
48	SMD resistor	6	R39,R53,R56,R71,R73,R118
49	SMD resistor	1	R54
50	SMD resistor	19	R22,R46,R49,R50,R52,R64,R65,R67,R70
			R72,R76,R81,R82,R84,R85,R94,R95,R105,R102
51	SMD resistor	5	R35,R37,R41,R5,R58
52	SMD resistor	1	R38
53	SMD resistor	3	R96,R36,R106
54	SMD resistor	1	R40
55	SMD resistor	3	R51,R74,R92
56	SMD resistor	1	R48,R68,R75,R90,R91
57	SMD resistor	1	R69
58	SMD resistor	1	R77
59	SMD resistor	2	R43,R108
60	SMD resistor	6	Remove R6,R7,R44,R110,R109,R111
61	Control circuit board	1	L04-1.40E

2) Component list of the L04-1.15B control panel

L04-1.15B			
No.	Name	Quantity	Marking and Description
1	pin resistor	1	RN1
2	pin	1	JP2
3	regulator tube	1	DZ1
4	bead	2	L2,L3
5	inductance	1	L1
6	electrolytic condenser	7	EC1,EC2,EC5,EC6,EC7,EC8,EC9
7	electrolytic condenser	2	EC3,EC4
8	potentiometer	1	RA1
9	potentiometer	6	RA2,RA3,RA4,RA5,RA6,RA11
10	potentiometer	2	RA9,RA10
11	diode	1	D3
12	LBD	2	D1,D2
13	Crystal oscillator	1	T1
14	integrated block	1	U1
15	integrated block	1	U3
16	integrated block	1	U2
17	integrated block	1	U31
18	integrated block	1	U6
19	prover pipe	1	U4

20	integrated block	1	U9,U10
21	integrated block	1	U8
22	integrated block	1	U21
23	pin	3	Respectively one in the lower and upper parts of L2,D_CT(upper part of R13),L_CT,R_CT(upper part of R44)
24	nylon socket	1	JP16
25	nylon socket	1	JP1
26	nylon socket	2	JP12,JP14,JP25(weld from Pin 1 to 4)
27	nylon socket	1	JP6,JP24
28	nylon socket	2	JP3,JP5
29	nylon socket	1	JP17和JP18(Pin 1 of JP17 is suspended)
30	IDC socket	1	JP22
31	IDC socket	1	JP20
32	SMD capacitor	11	C1,C3,C4,C5,C6,C7,C8,C9,C10,C20,C39
33	SMD capacitor	17	C2,C13,C14,C15,C16,C17,C22,C23,C25
			C26,C35,C38,C40,C42,C48,C49,C50
34	SMD capacitor	2	C11,C12
35	SMD capacitor	1	C37
36	SMD capacitor	1	C18,C21,C27,C31,C32
37	SMD capacitor	2	C28,C36
38	SMD capacitor	2	C30,C34
39	SMD capacitor	1	C41
40	SMD capacitor	4	C19,C29,C24,C33
41	SMD resistor	13	R3,R4,R13,R17,R18,R19,R24
			R25,R88,R98,R129,R130,R134
42	SMD resistor	31	R1,R2,R8,R9,R10,R11,R20,R22,R23,R30,R45
			R95,R99,R100,R113,R114,R126,R128,R131,R138,R143
			R144,R145,R146,R150,R151,R152,R153,R155,R156,R157
43	SMD resistor	2	R62,R63
44	SMD resistor	5	R33,R34,R47,R66,R93
45	SMD resistor	5	R55,R57,R83,R162,R163
46	SMD resistor	9	R16,R21,R39,R53,R56,R71,R73,R97,R118
47	SMD resistor	1	R54
48	SMD resistor	18	R42,R46,R49,R50,R52,R64,R65,R67,R70
			R72,R76,R81,R82,R84,R85,R94,R105,R164
49	SMD resistor	2	R135,R136
50	SMD resistor	5	R35,R37,R41,R5,R58
51	SMD resistor	1	R38
52	SMD resistor	2	R96,R36
53	SMD resistor	1	R40
54	SMD resistor	2	R51,R74,R92
55	SMD resistor	1	R48,R68,R75
56	SMD resistor	1	R69
57	SMD resistor	1	R77
58	SMD resistor	2	R78,R79
59	SMD resistor	3	去除R109,R110,R111
60	Control circuit board	1	L04-1.15B

3) Component list of the DCJMAIN0408_A control panel

DCJMAIN0408_A

No.	Name	Quantity	Marking and Description
1	resistor	1	R69
2	resistor	2	R1,R2
3	resistor	8	R3,R8,R20,R24,R26,R28,R70,R71
4	resistor	1	R72
5	resistor	3	R15,R18,R22
6	resistor	5	R17,R19,R21,R23,R27
7	resistor	7	R4,R6,R7,R9,R11,R12,R16
8	resistor	2	R5,R10
9	resistor	2	R14,R68
10	resistor	1	R13
11	resistor	1	R25
12	multilayer ceramic capacitor	2	C32,C33
13	multilayer ceramic capacitor	1	C10
14	porcelain capacitor	1	C34
15	porcelain capacitor	5	C11,C12,C14,C15,C16
16	porcelain capacitor	7	C1,C2,C3,C4,C5,C8,C9
17	porcelain capacitor	1	C31
18	porcelain capacitor	1	C13
19	electrolytic condenser	1	EC8
20	electrolytic condenser	4	EC1,EC6,EC7,EC9
21	diode	1	D7
22	Crystal oscillator	1	T1
23	bead	1	Corresponding hole position in the left side of JP11 (connection to digital and analog earth)
24	pin	2	One spot underneath the bead (anolog earth); one spot in the right side of EC1 (digital earther)
25	potentiometer	2	RA9,RA10
26	potentiometer	3	RA2,RA3,RA4
27	potentiometer	1	RA1
28	integrated block socket	1	IC6
29	integrated block socket	1	IC4
30	integrated block socket	1	IC2
31	integrated block socket	1	IC5
32	integrated block	1	IC3
33	integrated block	1	IC1
34	integrated block	1	IC6
35	Single chip	1	IC4
36	Storage	1	IC2
37	Single chip	1	IC5
38	nylon socket	1	JP6
39	nylon socket	1	JP11
40	nylon socket	2	JP1,JP3,JP7,JP17(LCD display only and equipped with application for external display machine)
41	nylon socket	1	JP12,JP14
42	nylon socket	1	JP15
43	nylon socket	1	JP16
44	nylon socket	2	JP4,JP5
45	Control panel	1	DCJMAIN0408_A

Appendix 3.2 Component list of the power panel

POWER0404_e			
No.	Name	Quantity	Marking and Description
1	resistor	1	4R14
2	resistor	2	4R5,4R11
3	resistor	2	4R12,4R7
4	resistor	5	4R1,4R2,4R3,4R10,4R15
5	resistor	1	4R8
6	resistor	1	4R4
7	resistor	2	4R6,4R9
8	resistor	2	4R13,4R16
9	potentiometer	1	4RA1
10	capacitor	1	4EC5
11	capacitor	3	4EC1,4EC2,4EC3
12	capacitor	1	4EC9
13	capacitor	1	4EC8
14	capacitor	2	4EC10,4EC11
15	capacitor	1	4C3
16	capacitor	4	4C1,4C2,4C4,4C5
17	diode	4	4D9,4D10,4D11,4D12
18	diode	4	4D1,4D2,4D3,4D4
19	diode	5	4D13,4D14,4D17,4D20,4D21
20	diode	2	4D5,4D6
21	thyratron	5	4Q1,4Q5,4Q8,4Q10,4Q11
22	thyratron	4	4Q2,4Q3,4Q4,4Q7
23	field effect tube	2	4Q6,4Q9
24	three-end regulator tube	2	4Q12,4T2
25	three-end regulator tube	1	4T1
26	Rectification Bridge	1	4BQ1
27	nylon socket	1	4JP1
28	nylon socket	1	4JP3
29	nylon socket	1	4JP2
30	nylon socket	1	4JP6
31	nylon socket	3	4JP4,4JP5,4JP7
32	power circuit board	1	POWER0404-E
33	pressing sleeve	4	
34	support column	1	
35	Heat elimination board	1	
36	Heat elimination board	2	
37	insulating piece	3	
38	insulating lining	3	
39	Pan head screws with cross recess	1	
40	Pan head screws with cross recess	4	
41	Flat padding	3	
42	Pan head screws with cross recess	1	
43	Pan head screws with cross recess	1	
44	hexagon nut	1	

Appendix 3.3 Component list of display panels

1) Component list of dspDIS0508-A display panel

dspDIS0508-A			
No.	Name	Quantity	Marking and Description
1	resistor	8	R1,R2,R3,R4,R5,R6,R7,R8
2	resistor	1	2R2
3	resistor	1	R17
4	resistor	1	R12,R18
5	resistor	3	R9,R10,R11
6	capacitor	2	C1,C2
7	capacitor	2	C3,C4
8	capacitor	1	EC1
9	Crystal	1	T1
10	LBD	7	2L1,2L2,2L3,2L4,2L5,2L6,2L7
11	thyratron	1	Q4
12	nexie tube	1	2LED1
13	nexie tube	1	2LED2
14	buzzer	1	U1
15	nylon socket	1	JP1
16	nylon socket	1	JP2
17	nylon socket	1	2JP3
18	integrated block socket	1	IC1
19	integrated block	1	IC2
20	integrated block	1	IC1
21	Circuit board for LED display	1	dspDIS0508-A

2) Component list of L02-03-2.BA1 LCD display panel

L02-03-2.BA1			
No.	Name	Quantity	Marking and Description
1	resistor	1	R2
2	resistor	2	R5,R6
3	resistor	2	R3,R4
4	electrolytic condenser	2	E1,E4(bend pin into 90 degrees and lay it down for welding)
5	electrolytic condenser	1	E3 (bend pin into 90 degrees and lay it down for welding)
6	electrolytic condenser	1	E2 (bend pin into 90 degrees and lay it down for welding)
7	porcelain capacitor	2	C1,C2 (pin has to be inserted to the bottom)
8	porcelain capacitor	2	C3,C4 (pin has to be inserted to the bottom)
9	pin resistant	1	RA1
10	Crystal	1	T1
11	thyratron	1	Q1
12	integrated block socket	1	U1
13	Buzzer	1	U3
14	nylon socket	1	J2EE

15	nylon socket	1	J8
16	double-row crooked pin	1	J5
17	HARP bracket of double-row crooked pin	1	J6
18	integrated block	1	U1
19	LCD display circuit board	1	L02-03-2.BA1

Appendix 3.4 Component list of external display panels

1) Component list of the L09-4 external display panel.

L09-4			
No.	Name	Quantity	Marking and Description
1	resistor	7	R2,R3,R4,R5,R6,R7,R8
2	resistor	2	R20,R21
3	resistor	7	R9,R10,R11,R12,R13,R14,R15
4	resistor	1	R1
5	resistor	4	R16,R17,R18,R19
6	porcelain capacitor	1	C1
7	porcelain capacitor	1	C4
8	multilayer ceramic capacitor	2	C2,C3
9	electrolytic condenser	1	EC1
10	diode	2	D1,D2
11	thyratron	7	Q1,Q2,Q3,Q4,Q5,Q6,Q7
12	Crystal	1	T1
13	nexie tube	2	LED1,LED2
14	nexie tube	1	LED3
15	integrated block socket	1	IC1
16	Single chip	1	IC1
17	Connection wire	1	SGND(black wire),VCC(red wire),RXD(green wire),TXD(yellow wire)
18	PCB board	1	L09-4

2) Component list of the XSQ02-A external display panel

XSQ02-A			
No.	Name	Quantity	Marking and Description
1	resistor	8	R2,R3,R4,R5,R6,R7,R8,R12
2	resistor	3	R14,R15,R16
3	capacitor	2	C1,C2
4	capacitor	1	C3
5	Crystal	1	T1
6	thyratron	3	Q1,Q2,Q3
7	capacitor	1	EC1
8	nexie tube	1	2LED1
9	nylon socket	1	JP1
10	integrated block socket	1	IC1

11	integrated block	1	IC1
12	Circuit board for external display	1	XSQ02-A